

Photonics Society of Chinese-Americans

Issue 0042: January 1, 2001

Editors: Chun-Ching Shih and Su-Miau Shih

Contact: Tel (310) 814-0318; Fax (310) 812-4975; cc.shih@trw.com

Published on Websites: www.psc-a.org & www.psc-sc.org & www.psc-eoa.org

Content

2000 PSC Officers	C. C. Shih	Page 2
Annual Meeting Announcement <i>(March 18, 2001, at UC Irvine)</i>	Raymond Wang	Page 3
2001 Fellow Nomination Form <i>(Due date: February 28, 2001)</i>	Pochi Yeh	Page 4-5
PSC Scholarship Announcement	C. C. Shih	Page 6-7
Scholarship Nomination Form <i>(Due date: February 28, 2001)</i>	C. C. Shih	Page 8
Society News: Honor Rolls	C. C. Shih	Page 9
Theme Article: Introduction to UCI/INRF <i>(Integrated Nonosystems Research Facility)</i>	Chin C. Lee	Page 10-14

2000-2001 PSC Officers:

Board of Directors	Dr. Bob Lin (chair) Dr. Chi. H. Lee Dr. Hsing Kung	(415) 857-7218 (310) 405-3739 (510) 683-5900x126	blin@spica.hpl.hp.com chlee@eng.umd.edu hkung@aol.com
President	Dr. Y.J. Ray Chen	(410) 455-3507	ychen@umbc.edu
First Vice President	Dr. Raymond Wang	(714) 730-6256	raymondwang8@ compuserve.com
Second Vice President	Dr. Gordon Li		gordon.li@e-tek.com
Treasurer	Dr. Yanhua Shih	(410) 455-2558	shih@research.umbc.edu
Corresponding Secretary	Dr. ShiaKai Liu	(972) 918-7586	0003782383@mcimail.com
Recording Secretary	Dr. Haifeng Li		hli@submarinesystems.com

Special Committees:

Fellowship Committee	Dr. Pochi Yeh	(805) 893-3981	pochi@ece.ucsb.edu
Scholarship Committee	Dr. Chun-Ching Shih	(310) 814-0318	cc.shih@trw.com
Publication Committee	Dr. Chun-Ching Shih Dr. Su-Miau Wu Shih	(310) 814-0318	cc.shih@trw.com

2001 PSC Annual Meeting
(Preliminary Announcement)

Date: Sunday, March 18, 2001
Place: University of California, Irvine
Cost: \$30 for regular attendee, \$15 for student
Title: OFC Business Opportunities and Challenges

Agenda (preliminary, will be revised)

12:30-1:00 Registration

Dr. Bill Wuang and Professor C.C. Lee

1:00-1:10 Welcome and Introduction

PSC president: Professor Ray Chen

1:10-2:10 Session I: Overview of Business Opportunities in Fiber Optics

Components and Fiber Network System

Session Chair: Dr. H.K. Liu

Tentative Speakers: Dr. Tingye Li & Dr. Gee-Kung Chang,

2:10-2:40 Session II: Challenge of Mass Production of OFC Elements

Session Chair: Dr. S.L. Chao

Tentative Speakers: Dr. Paul Chung, Dr. J.J. Pan, & Dr. J. Jim Hsieh

2:40-2:50 Session III: Bor-Uei Chen Memorial Scholarship Award

Session Chair: Dr. C.C. Shih

2:50-3:10 Coffee Break

3:10-3:30 Session IV: OFC Business Opportunities in Taiwan

Session chair: Dr. Raymond Wang

Speaker: Dr. Peter T.C. Shih

3:30-5:30 Session V: Business Joint and Acquisition in OFC industry

Session Chair: Dr. Owen Wu

Tentative Panelists:

a). Dr. Hsing Kung

b). Dr. J.J. Pan

c). Dr. Robert Hsieh

d). Dr. Milton Chang

e). Dr. Jim Hsieh

f). 2 Banker and 1 Lawyer

4:30-5:30 Panel discussion and Q/A

5:30-10:00 Networking and Dinner

(At UCI staff and faculty restaurant and cost to be determined)

Fellow Nomination Form

1. Candidate's Name:

2a. Current Position:

2b. Employer:

3. PSC Membership since (date):

4. Education:

5. Professional experiences (list employer, position, and dates):

6. Area of Professional Specialization:

7. Professional Accomplishments and Contributions meriting election to Fellowship:

8. Other noteworthy pertinent accomplishments and service:

9. Publications and patents (Attach separate sheet if necessary):

10. Proposed citation (No more than 20 words):

11. Awards and Honors:

Nominated by: _____
signature Date

Name:

Address:

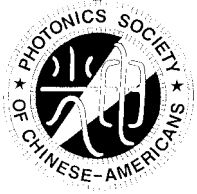
Telephone:

Fax:

E-mail address:

Instruction for sponsor: The primary sponsor must complete the Fellow Nomination Form and arrange with at least two additional individuals for completion of Fellow Reference Forms. You may copy the forms or use your own version of the form with the same format. Please send completed forms before February 28 to: Dr. Pochi Yeh, 405 Camino De Celeste, Thousand Oaks, California 91360. Fax: (805) 493-2255, Email: Pochi@ece.ucsb.edu

PSC Scholarship Committee Announcement



The Photonics Society of Chinese-Americans

Announcement

The Seventh Bor-Uei Chen Memorial Scholarship Award

by *Chun-Ching Shih*, Chair

On behalf of the Bor-Uei Chen Memorial Scholarship Committee, I am pleased to announce that the sixth scholarship will be awarded in the 2001 PSC Annual Meeting in the Bay Area, California. This year, the committee would like to move up the announcement date, so that the prospect candidates have more time to prepare their application. The Committee is now accepting nominations of qualified candidates from any **sponsoring PSC members**. You can copy the nomination form on the next page for your own use and attach any supporting document to demonstrate candidate's achievements in academics and research. Form is also available on PSC web sites: (www.psc-a.org) (www.psc-sc.org) or (www.psc-eoa.org) or send your request directly to me at cc.shih@trw.com. The nomination deadline is **February 28, 2001**. Any nominations received after this date will not be considered. Here are some highlights about this memorial scholarship:

1. The purpose of this scholarship is 1) to honor Dr. Bor-Uei Chen for his contributions in photonics and his services to the photonics community; 2) to recognize outstanding graduate students in the field of **optical communications** and **photonic devices**.

2. A scholarship committee, appointed by the PSC Board of Directors, is responsible for making announcements, conducting fund drive, and overseeing the selection process. The members of the Scholarship Committee include

Chun-Ching Shih (Chair)
Tingye Li
Pochi Yeh
Hua-Kuang Liu

Chinlon Lin
J.Y. Ray Chen
Bob Lin
Chi H. Lee

Hsing Kung
Arthur Chiou
Shui-Lin Chao
C. L. Tang

3. Each year, the Committee will issue a call for nomination on the October or January issue of *Photonics Link*. The committee will oversee the review process of applications and make recommendations to the PSC Board of Directors for final approval. The winner or winners will be announced on the April issue of *Photonics Link*.

4. The selection of scholarship winners will be based on the merit of candidate's research work, which must be documented by publications on technical journals or conference presentations and supported by strong recommendation from the candidate's sponsor or advisor.

5. The scholarship award consists of an award certificate and a check of \$1,000. The amount of scholarship and the number of winners may vary, and the Committee reserves the right to make any changes as necessary. The winners in past years include:

1995: Lih-Yuan Lin (UCLA) Jerry Chen (MIT) Yan Sun (Stanford)
1996: Li-Ping Chen (UCLA) Yongan Wu (Stanford) Wei-Chiao Fang (UIUC)
1997: Wenhua Lin (UMBC)
1998: Xiaonong Shen (UCSB) Jianhua Zhao (UCSB)
1999: Ming Li (Rensselaer) Alan Yuan-Chun Hsu (UIUC)
2000: (No Recipients)

In 2001, the Committee plans to select one or two award winners.

6. The scholarship will be awarded annually and presented at the PSC Annual Meeting. The winners will be invited to give a short presentation about his/her research. They should make every effort to attend the Annual Meeting.

7. Key dates:	October 1, 2000	Announcement on <i>Photonics Link</i> and web sites
	February 28, 2001	Deadline for receiving nomination materials
	March 21, 2001	Review by the PSC Scholarship Committee
	April 1, 2001	Announcement of winner on <i>Photonics Link</i>
	May 6, 2001	Scholarship awarded at the Annual Meeting

The Photonics Society of Chinese-Americans

Dr. Bor-Uei Chen Memorial Scholarship Award Nomination Form

(Attaching a brief resume to this form is recommended)

Full name of nominee _____

Date of birth _____ Place of birth _____

Address _____

Tel _____ Fax _____ e-mail _____

School attending _____

Department _____

Major research area _____

Degree program _____ Year expected to receive the degree _____

Thesis title (if any) _____

Thesis advisor (if applicable) _____

School of undergraduate _____

Major in undergraduate _____ Graduation year _____

Papers & Patents* _____

Honors & Awards* _____

* Attach a separate sheet if necessary

Other comment (such as special projects, outstanding research achievements, etc.)

Sponsor's name _____ Tel _____

Address _____

Sponsor's signature _____ Date _____

Return this nomination form, together with supporting information, no later than February 28, 2001,
to: Chun-Ching Shih, PSC, 1517 Via Fernandez, Palos Verdes Estates, CA 90274, USA

Society News

Honor Rolls:

Prof. Chin C. Lee of University of California, Irvine, was elected an IEEE Fellow, effective 1 January 2001, with the following citation:

“For pioneering research in fluxless bonding technology and contributions to thermal design tools for electronic devices and packages.”

Congratulations to Prof. Lee for his distinguished achievements.

Integrated Nanosystems

The UCI Integrated Nanosystems Research Facility (INRF) promotes research and develops technology for integrated nanosystems, targeting areas such as biomedical, communication and networking technologies. Integrated nanosystems is a new field of research, similar in nature to MEMS (micro-electrical-mechanical systems) research, but with a different emphasis. MEMS technology uses semiconductor techniques to build microscopic mechanical devices in silicon or similar materials—typical devices are pressure transducers and accelerometers. Integrated nanosystems takes MEMS technology and integrates it with micro-scale technologies from biology, chemistry, photonics and other fields to produce hybrid integrated systems. Integrated nanosystem technology allows a much larger assortment of devices to be developed for broader applications. Industries such as life and health sciences, environmental sciences, and chemical sciences can benefit from such technology. Example devices might be a self analyzing biological assay on a chip, a self powered, communicating remote sensor, or a micro chemical factory.

It is fundamental to understand that integrated nanosystems requires a strong cross-disciplinary approach, a willingness to pursue new, non-traditional manufacturing techniques, and full understanding of the total needs of the technology. Whereas MEMS can be quite successful using only semiconductor based technologies and developed only by electrical engineers, integrated nanosystems requires more. Researchers from many fields must come together and work together to understand the total system requirements. Several different technologies must be developed and brought together, and a holistic approach to the system, from materials, to characterization, to final packaging must be included in the development design. This process can be called “engineering the microworld”. Just as an engineered system in the macroworld integrates many different technologies together—so too is the INRF vision for the microworld.

The challenges of integrated microsystems are many, and important fundamental technologies must be developed before the field can reach its potential. For this reason, the INRF has been created. Managed by UCI, a major state university, it provides the means for developing and integrating many micro- and nano-scale technologies. INRF allows the study of issues such as the integration of different materials and processes, the development of new micromachining techniques, and the characterizations of microscale devices. For example, one recent advance at INRF has been the development of techniques for microfabricating plastic devices. Plastic microdevices are more suitable for biological and medical applications, can be used for more effective micropackage design, and allows for the development of cheaper, disposable devices. Work is underway to integrate this technology with silicon based processes to produce more functional “bio-chemical-electrical-mechanical-optical” systems for applications such as fiber optics communications switching, combinatorial chemistry, and total analysis biochemical chips.

The INRF also hopes to foster communication between traditionally distant fields such as bioscience and engineering. This is accomplished through collaborated projects, seminars, courses, and general outreach. Through collaboration on projects from different fields, and by enlisting researchers from different backgrounds, INRF hopes to develop true cross-disciplinary research. One example is a recent collaboration between cell biologists in the UCI Physiology Department, bio-photonics researchers from the UCI Beckman Laser Institute, and electrical engineers from the UCI Electrical and Computer Engineering Department to study and develop a chip-based, single cell analysis system.

Finally, INRF seeks to involve industry in the development of integrated nanosystems. This involvement comes through sponsored projects which emphasize micro- and nano-scale research. Industry collaborations provide a much needed market perspective and emphasize practical issues which academic researchers may overlook. Currently, the INRF hosts over 25 industrial collaborations which sponsor research aimed at broad areas of nanoscale technology. Examples of projects include microscale packaging development, biochip development,

photonic materials characterization, and communications/networking development. In addition, INRF allows industrial partners to use the facility for prototyping and processing services.

Research at the INRF

Research at the INRF seeks to develop micro- and nano-scale technologies which will enable engineering of the microworld. Academic and industrial researchers from a variety of backgrounds collaborate on various projects to develop microscale technology. Efforts include work in the following fields:

- Microsystems science
- Manufacturing technology
- Device design and development
- Characterization techniques
- Materials science

Applications from this research will extend into almost all fields of science and engineering, including biomedical, communications, chemical, biological, pharmaceutical, environmental, and health sciences.

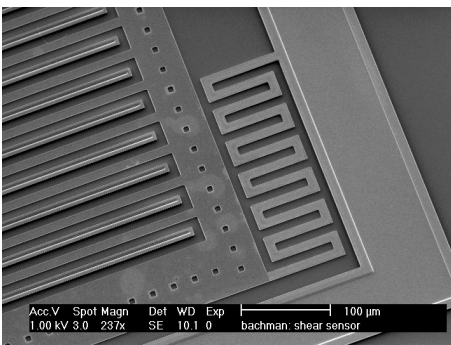
Example Projects

Some recent examples of INRF's enabling technologies are shown below. Ongoing projects (not shown) include development of communications technologies, micropackaging, DNA sequencing technologies, capillary eletrophoresis chips, photonic systems, and polymer microfabrication technology.



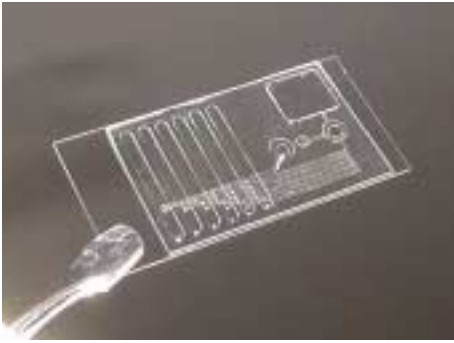
Flexible microfluidic membranes

Demonstration of microfluidic channels system built using UCI technology (shown attached to human forearm). The system is capable of metering nano- and picoliters of fluid and is fabricated in a flexible polymer membrane built from Mylar and Teflon films. An example application could be to monitor blood, or deliver drugs through a patch. Channels remain intact and deliver fluids properly despite considerable handling abuse.



Micro shear stress sensor

SEM scan of a surface micromachined device designed at UCI to measure shear stress on wing surfaces during wind tunnel tests. Four micro-springs (70 microns wide) hold the stress plate in position and the unit is read remotely using a laser. The part is made from silicon and gold and designed for aerospace applications.



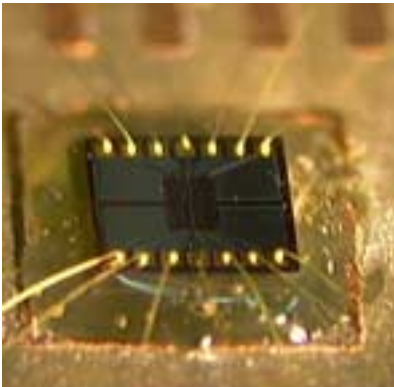
Microfluidic chip assay device

Micro assay device made at UCI from multiple layers of polymer materials. This device couples microfluidic, electronic, mechanical and photonic technologies to deliver a disposable chemical lab in a hand-held unit. The specific application is for food safety inspection using chemiluminescence tagging, but the technology is general purpose.



Micro hydraulic “virtual valves”

Demonstration of microfluidic process control using microhydraulics. “Virtual valves” exploit the unique behavior of hydraulics at the microscale to control fluid flow without the need for internal valves. New innovations in the way fluidics is engineered for microsystems will result from this research.



Binary gas mass flow sensor

Demonstration of device to measure mass flow in natural gas engines. The piece is micromachined silicon, silicon nitride, and gold. Using a 10 micron heater and various temperature sensors, the unit can simultaneously monitor gas flow, direction, and relative concentration of two gases.



Micro turbulence flow studies

Microchannel test piece containing sealed glass and silicon channels, 1 micron in depth, for experiments measuring the turbulent effects of flow in the microscale. This part is designed to handle test fluids at 2000 psi and at 200 °C. These studies will help enable the development of microfluidics for micro cooling units.

Equipment at the INRF

The INRF clean room is a class 1,000/10,000 facility, with class 100 work areas and with all major semiconductor fabrication equipment. It is set up to be used in a multi-user mode. Training, maintenance, and common supplies for all equipment is provided by the INRF. Most of the equipment is listed below. In addition to the clean room, further processing and characterization facilities are available through the individual research labs of UCI faculty affiliated with the INRF.

INRF equipment list

Sample Preparation

Ultra Tech Inc. 4000 rpm Diamond Saw
Buhler Isomet 11-1180-160 Low Speed Saw
Metals Research LTD. Multipol 2 Polisher
K&S 775 Dicing Saw
Signatone Lapping Machine

Thin Film Deposition and Material Growth

Iron-film Molecular Beam Epitaxy
Airco/Temescal CV-8 4-hearth E-Beam Evaporator with IC6000
Plasma-Therm Model 790 PECVD System (dielectric)
Hummer DC gold sputter system
Materials Research Corp. 8632 RF Sputter System
Perkin-Elmer 2400-8L DC & RF Sputter System
Thermco 6" four-tube furnaces (LPCVD of oxide, nitride, etc.)
Thermco Diffusion Furnace
Perkin-Elmer 4400 Sputterer

Dry Etching

Ion Tech Ion Milling/Secondary Ion Reactive Sputtering/System
Branson/IPC PM-1813 Barrel Reactor (photoresist ashing)
Focussed Ion Beam
Plasma-Therm Model 790 RIE System
Tegal Plasmaline Plasma Asher

Wet Etching

14 Wet bench stations with laminar flow hoods

Thermal Processing and cycling

AG Heatpulse 2146 Rapid Thermal Anneal/Oxidation System
TranTemp 2" dia. semi-transparent tube furnace
Cincinnati Sub-Zero environmental testing chamber
Lindberg 5" Dia. Crucible Furnace
Lindberg 3" Dia. Tube Furnace
Box furnace

Photolithography & Mask Making

20:1 Mask Reduction Camera system to produce HRP photomask
Karl Suss Gyrset photoresist spinner
GCA/David Mann 5:1 and 10:1 Photorepeater
Ultratech 1000 Wide Field Projection Stepper System
Karl Suss First MJB3 Contact Aligner—vacuum mode
Karl Suss Second MJB3 Contact Aligner—split-field microscope
Headway Research Spinner
Kasper 2001 Aligner
Kasper 3001 Aligner

Packaging

K&S 4123 Gold Ball Bonder

MechEl Thermocompression Wire Bonder

Analytical Equipment

Topometrix Near-Field & Atomic Force Microscope System
ISI SR-50A Scanning Electron Microscope with EDS
Optical Microscope—Olympus MS with CCD, computer and monitor
Optical microscopes, various
Rudolph Auto E1 Ellipsometer
Tencor Alpha-Step 200 surface Profilometer
Hitachi SEM
Hummer coater
Zygo Interferometer

INRF Faculty and Staff Contacts

Many researchers use the INRF to develop micro- and nanoscale technology. Research teams come from UCI and other campus units, as well as from industrial partners. An executive committee directs the research activities and policies of the INRF. This is composed of UCI faculty and staff who volunteer their time for this purpose. Any of these committee members may be contacted for information about the INRF. Individual research programs may also be coordinated through any UCI faculty affiliated with the INRF.

UCI Integrated Nanosystems Research Facility

University of California, Irvine

2237 Engineering Gateway Building

Irvine, California 92697-2625

Phone: 949-824-2819

FAX: 949-824-3732

Web: www.INRF.uci.edu

INRF Administration

INRF Director		
Prof. G. P. Li	(949) 824-4194	gpli@uci.edu
Director of Operations		
Prof. Chin Lee	(949) 824-7462	clee@uci.edu
Training Supervisor		
Prof. Henry Lee	(949) 824-3148	hlee@uci.edu
Facility Administrator		
Ms. Vickie Tencer	(949) 824-2819	vtencer@uci.edu
Facility Manager		
Mr. Jake Hes	(949) 824-2819	jhes@uci.edu