LASER
BECKMAN LASER INSTITUTE

IN THE NEWS

Fall 1997

New Wing Construction to Begin

The Institute's long-awaited facility expansion is slated to begin in early 1998, with completion anticipated by December 1998. The expansion will add 11,280 square feet, an increase of more than thirty percent over the Institute's current size.

The expansion is being undertaken to house a Photonic Incubator to utilize light technologies (lasers, optics, detectors, etc.) in the development of new biomedical systems.

Rafiki, an iguana, has recovered fully from laser surgery. *(Please see Veterinary Update on pg. 7)*

"We're thrilled to be finally breaking ground on this exciting project," states Institute Director Michael W. Berns, Ph.D. "This new space is absolutely essential due to a substantial growth in Institute programs, especially in the area of working with industrial partners."

Housed in a two-story wing immediately adjacent and attached to the Institute's patient and animal treatment facilities, the Incubator will include: four applications labs for developing and prototyping new medical devices; an applications/operating room for testing new devices on patients; and office and conference space for researchers and corporate partners.

The new wing was designed by Bobrow/Thomas and Associates of Los Angeles, Calif.; the project is being managed by the UC Irvine Office of Design and Construction Services.

Total project costs are more than $2.88 million. Funding has been provided by a variety of sources, including a $1 million grant from the Economic Development Administration (Department of Commerce). The remaining funds have come through the generosity of Institute's donors, including the Beckman Family Trust and Hester Family Foundation. *(Please see related stories on pgs. 2 and 3.)* ■

Newsbriefs

GRANTS AWARDED

Institute researchers recently were awarded grants from the National Institutes of Health (NIH) and The Whitaker Foundation, a private Virginia-based foundation supporting biomedical engineering.

Clinical Research Director Yona Tadir, M.D., will use his highly-competitive "Investigator Initiated" NIH grant to study photodynamic treatment of benign uterine disease. Assistant Professor Petra Wilder-Smith, D.D.S., Ph.D., working with Physical Optics Corporation, will use her NIH Small Business Innovative Research grant to study the feasibility of diagnosing oral cancer using an optical sensor. Zhongping Chen, Ph.D., assistant professor and Whitaker grant

(Continued on pg. 8)

A Family of Friends

by Michael W. Berns, Ph.D.
Arnold and Mabel Beckman Professor
President and CEO

For non-profit institutions it is an increasingly glossy world—elaborate fund-raising events, large-dollar foundations, and sophisticated brochures and solicitations.

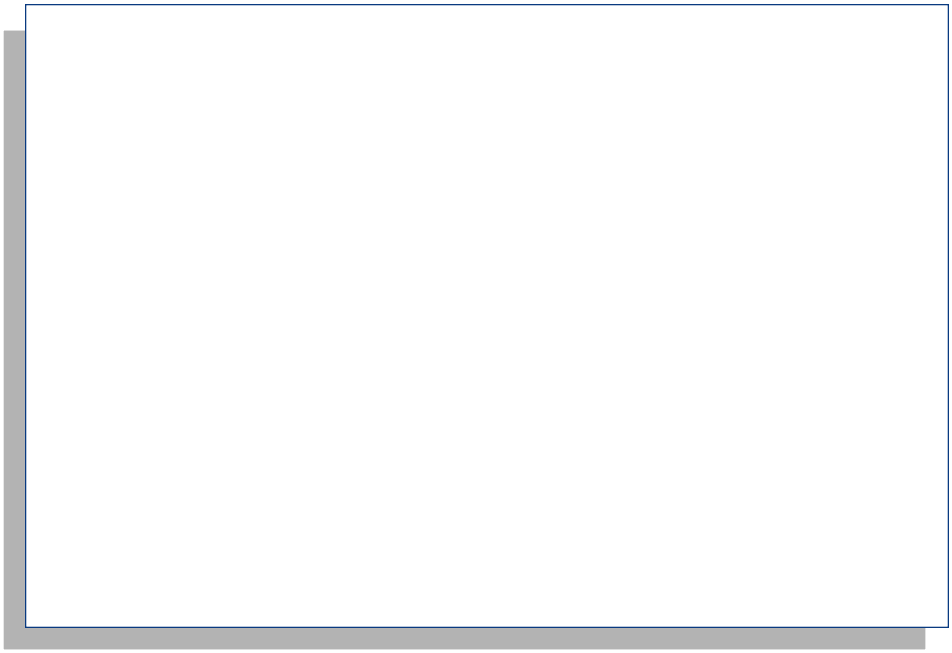
Noting this trend, I am heartened that the vast majority of the Institute's success in attracting philanthropy is through the "personal touch," and more specifically, through "families" of individuals who feel a close attraction and relationship with the Institute's programs.

It was Arnold Beckman's initial visit to my lab on a rainy day in 1980 that started a close personal relationship between myself and the Beckman Family. Because of the ongoing support from Arnold and Mabel Beckman, and now their daughter Pat Beckman, the Institute maintains a close tie to its "founding family."

We also have been honored by the support of Charley and Nora Hester who "adopted" the Institute as one of their favorite philanthropies. Charley chaired our Board of Directors and was a long-time and unwavering supporter of the Institute. In addition, I was pleased to note that after Charley's death last year, the Hester's daughter, Marilyn Hester Gianulias, decided to continue the family's commitment to the Institute.

Through his close friendship with Arnold Beckman, David Packard (of Hewlett Packard) became interested in the Institute and brought us into the "Packard Family" circle.

My wife Roberta and I always will remember the week in northern Canada at David Packard's fishing lodge (accessible only by sea plane), and being taught how to "tie a fly" by the master. Unforgettable too, was my impromptu lecture using rocks and twigs to explain how a laser device produces a coherent beam of light.



Chao family portrait taken during the Cancer Center renaming.

Here at the Institute, we have been fortunate that other families have chosen to "adopt" us.

For example, there are families like the Brenners. Nat and Joan Brenner, who co-chair our Support Group, along with their daughter Sari and son Matt, are all loyal members of the larger Institute "family."

The Olenicks are another such family. Everett and Charlotte Olenick's generosity and warm feelings have played a key role in boosting the Institute's morale. *(Please see a remembrance of Dr. Olenick on pg. 3.)*

There are many other families—our Support Group members, Board members, those who generously have given of their time—who are too numerous to mention. Know that we appreciate all of you.

Now, we are thrilled to acknowledge another family who has adopted the Institute—the Chao family.

John Chao and his children Phylis Hsia, Richard Chao, Allen Chao, and Agnes Kung already have left a major imprint on UC Irvine through their support of the UCI Clinical Cancer Center (renamed the Chao Family Comprehensive Cancer Center and recently designated a comprehensive cancer center by the National Cancer Institute).

The Chao's generosity continues with John Chao's recent establishment of a pulmonary research endowment at the Institute.

Under the direction of Dr. Matt Brenner, the Hsi Hsiung Chao Endowment for Pulmonary Research will fund research to determine the optimal amount of tissue to remove during lung reduction surgery. It is hoped that the surgical procedure, currently in preclinical testing, will improve the breathing ability of emphysema patients.

The Chao family's willingness to support UC Irvine's programs is appreciated by not only the Institute "family," but also all of UC Irvine.

The extended Institute family looks forward to a long and warm relationship with the Chao family. ■

Dr. Everett Olenick: A Commitment to Education

Dr. Everett J. Olenick, an ophthalmologist and early supporter of the Beckman Laser Institute, died of complications associated with pneumonia on October 6, 1997.

He is survived by Charlotte, his wife, and three children—Jonathan, Betsey and Jed—the latter two graduates of UC Irvine.

A believer in the power of education, Dr. Olenick and his wife contributed to the College of Medicine and the Irving H. Leopold Chair in Ophthalmology, in addition to supporting the Institute's programs.

"We believe that the salvation of the world lies in education," Dr. Olenick once said. "Carefully monitored research," he explained, "contributes so much by widening our scope of understanding and thus improving our standard of living. Our association with UC Irvine is particularly enriching because our children were actively involved with the University."

While at UC Irvine, the Olenick's youngest son, Jed, served as student body president. He later returned to the university to earn an M.B.A. Jed's wife, Nancy, received a doctorate here.

Daughter Betsey Olenick Dougherty, another UCI alumnus, worked as an architect for UCI, planning several buildings on campus. In addition, her husband, Brian, earned his M.B.A. at UC Irvine and has taught architecture as a part-time faculty member.

Charlotte, Dr. Olenick's wife, also has been active on campus as a member of Town and Gown, a philanthropic support group that brings together the community and University faculty.

Charlotte and Everett Olenick.

The Olenick's oldest, Jonathan, an ophthalmologist in Newport Beach, practiced with his father for over 20 years.

It was Dr. Olenick's interest in ophthalmology research, as well as his friendship with Drs. Keates and Leopold, both former chairmen of UC Irvine's department of ophthalmology, that initially drew him to the Institute.

"Dr. Olenick always showed great interest in our multidisciplinary laser research program and was a friend of the Institute for many years," notes Institute Director Michael Berns, Ph.D. "I especially will miss his sense of humor and sincere desire to help others." ■

Institute Pays Tribute To Expansion Donors

Support for the Institute's Photonic Incubator has been overwhelming. Thank you to all of our supporters who have helped to make it a reality.

Gifts Over $50,000

Beckman Family Trust

Hester Family Foundation

George Hoag Family Foundation

Margaret E. Oser Foundation

U.S. Economic Dev. Administration

Gifts $10,000 - $50,000

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Audrey Schneiderman

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A Photomedical Approach to Cervical Cancer

Nearly 5,000 American woman will die of cervical cancer this year. Using optical techniques, Institute researchers aim to shrink this figure significantly.

"By developing new diagnostic tools and treatment alternatives, we hope to reduce the incidence of pervasive cervical cancer," says Institute researcher and gynecology fellow Kristin Keefe, M.D.

Light vs. Scalpel

Dr. Keefe and Institute researchers Michael Berns, Ph.D., Rene Hornung, M.D., Tuan Pham, Yona Tadir, M.D., Bruce Tromberg, Ph.D., along with Chao Family Comprehensive Cancer Center colleague Philip DiSaia, M.D., already have determined that normal and abnormal cervical tissue absorbs and scatters light differently.

The researchers shine laser light through normal cervical tissue and tissue with cervical intraepithelial neoplasia (CIN), a disease that typically progresses through several stages before becoming cancer. "The way the tissue interacts with the light tells us what is happening within the tissue," explains Pham, an M.D.-Ph.D. student at UC Irvine.

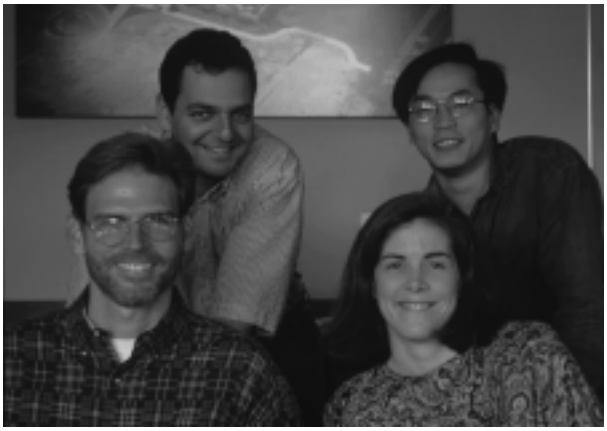
During the past year, the team of scientists has found that normal tissue more strongly absorbs certain light wavelengths than abnormal tissue. They've also determined that advanced CIN lesions—grade III, for example—scatter light less intensely than grade I lesions.

"We would like to acquire enough optical and physiological data so that, by shining laser light on cervical tissue, we can easily differentiate normal tissue from a grade I, II, or III abnormality," says Dr. Keefe. "Such data could result in the design of a non-surgical diagnostic tool."

Currently, the only diagnostic tool is colposcopy, which uses a microscope to examine a patient's cervix. During colposcopy, any abnormal areas found are biopsied, surgically removed for further microscopic analysis. It's a procedure that patients find uncomfortable, says Dr. Keefe.

"If we could take the scalpel out of the equation," she notes, "testing for CIN would become a less invasive procedure."

The team of scientists also hopes to make the actual treatment of CIN less traumatic.



(Clockwise from top left) Dr. Rene Hornung, Tuan Pham, Dr. Kristin Keefe, and Dr. Bruce Tromberg. Not shown Drs. Berns, DiSaia and Tadir.

"Generally, cervical lesions can be managed in a few ways," explains Dr. Tadir, the Institute's director of clinical research. "If cancer isn't present, we may monitor the lesions for up to a year before definitive treatment. Sixty percent of the time, low-grade, stage I lesions spontaneously disappear. If the lesions persist—and the physician and patient opt for treatment—a variety of invasive techniques are available: cryotherapy, laser thermal ablation, electrocautery, or excision using a heated wire or scalpel. Unfortunately, these aren't without side effects: bleeding; infection; excessive discharge; and cervical scarring, narrowing or incompetence. We hope to use photodynamic therapy (PDT) to create a less invasive treatment."

Photodynamic Therapy

PDT is a two-step process that uses a light-activated drug and a laser. First, the drug is topically applied to the area to be treated. Then, when the laser shines on the photosensitized tissue, the drug creates a chemical reaction that kills only the targeted tissue, leaving the rest relatively unaffected. PDT is painless and causes little vaginal discharge, Dr. Keefe explains. "The patients we've treated thus far have found PDT quite acceptable."

Dr. Keefe thinks that the targeted, non-invasive nature of PDT may offer a therapeutic alternative for CIN.

"At this stage, we don't know what percentage of CIN lesions will become cervical cancer. Therefore, it is reasonable to assume that we're treating some lesions that would regress without treatment. PDT may be the ideal approach because of its selectivity in treating only diseased cells," Dr. Keefe notes. "We hope to be even more selective as we gather additional data on the optical properties of the cervix, and fine-tune our diagnoses accordingly."

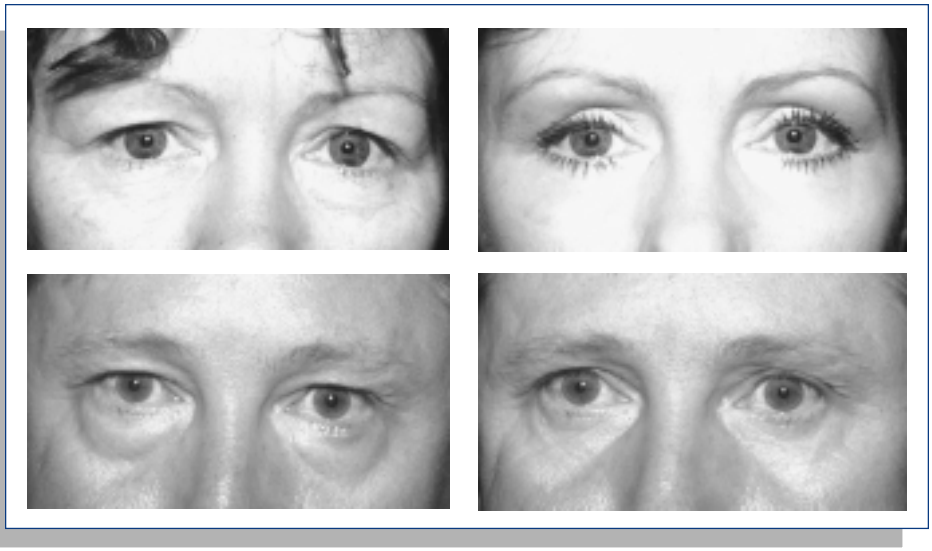
So far, 26 patients have been treated with PDT. Institute researchers anticipate that higher light doses will be more effective than lower doses.

Overall, the scientific team is optimistic about the use of optical techniques in medicine. "We aim to develop tools for the diagnosis and treatment of cervical disease," say Dr. Tadir, " as well as for the detection of breast and ovarian cancer." ■

Lasers Revolutionize Eyelid Surgery

Rose was fed up with being asked if she was tired. "I didn't feel tired but I looked it. The puffiness under my eyes gave me a tired look," Rose, 42, explains.

Then she heard of laser blepharoplasty, a procedure that improves the eye area's appearance by lifting the upper eyelids and removing excess fat and skin from around the eye.



Before (top left) and three weeks after laser blepharoplasty and laser skin resurfacing around the eye area (top right). Before (bottom left) and five days after laser blepharoplasty (bottom right). Photos supplied by Dr. Conn.

The Laser Advantage

Blepharoplasty isn't new—women since Marilyn Monroe have taken advantage of the procedure. What's new is the addition of the CO_2 laser.

The CO_2 laser, an infrared laser, shoots a narrow beam of light that, when absorbed by tissue, is converted to heat. The heat vaporizes tissue in a precisely controlled manner that is powerful enough to seal small capillaries, greatly reducing bleeding.

Traditional blepharoplasty lacks this advantage, often requiring cauterization with conventional electrocautery devices to stop bleeding. Cauterization may damage nearby tissue—a side effect that the laser, for the most part, eliminates.

By reducing tissue damage, laser blepharoplasty produces the same long-term result as the traditional procedure, but with little or no post-operative bruising. Many patients return to work the next day.

Rose's Blepharoplasty

Rose discussed the procedure with two physicians before her sister mentioned the Surgery Laser Clinic at the Beckman Laser Institute.

Rose met with Howard Conn, M.D., one of the Institute's two ocular plastic surgeons. Dr. Conn recommended treatment of Rose's lower lids, as opposed to the full blepharoplasty suggested by the other physicians Rose had consulted.

"Laser blepharoplasty and laser skin resurfacing are a very powerful combination and the right choice for many patients," says Dr. Conn. "Rose, however, didn't need the complete procedure. She had very few wrinkles around her eyes."

He explains that the puffiness underneath Rose's eyes was creating her tired look. "Eliminating that would give her the refreshed look she sought," Dr. Conn notes.

She was administered local anesthesia during the 45 minute procedure and went home 30 minutes after surgery.

Post-operative Results

Rose is very happy with the results.

"I was pleasantly surprised to wake up the next morning with no bruising or swelling," she says. "I was prepared to take time off work." Rose worked at home the next day.

Institute Ocular Plastic Surgeon Richard Weiss, M.D., says that such results can be expected.

"The laser allows surgeons to achieve cosmetic improvements around the eyes more safely and with less bruising than ever before," he notes.

As directed, Rose used ice compresses for the first few days after surgery.

Dr. Conn explains that warm compresses can be helpful during days four through seven, but that Rose did not need them. And, since Rose's incision was made behind her eyelid, there were no sutures to remove.

Overall, Rose calls her experience with the Surgery Laser Clinic a positive one.

"I was nervous because it was my first procedure," Rose says. "The staff at the Surgery Laser Clinic took time to make me comfortable throughout. It was a very caring environment. I would recommend this procedure and the Beckman Laser Institute to my family and friends."

As for comments about her looking tired? Rose now says that she is getting compliments.

"I went to a family reunion a week after my laser surgery," she says. "My family didn't know about the procedure but they noticed the difference in my appearance. 'You look so rested,' they told me. That was nice to hear." ■

Lazing Lizards

Rafiki had a problem—a recurrent tumor on her nose that would not respond to surgery. Institute Veterinary Director George Peavy, D.V.M., had a solution—laser treatment. Never mind that Rafiki, a three-year-old female iguana, was the first four-legged reptile to visit the Institute's operating room. "I thought that removing the growth with the CO_2 laser would be more effective and precise than the surgery that previously had been tried," says Dr. Peavy.

And it was. Rafiki was treated at the Institute in June and, according to her veterinarian, William Ridgeway, D.V.M., the tumor has not returned.

Owner, Missy Munson, is relieved. "Rafiki is like my daughter. I'm so happy that her cancer is gone for good."

Munson first noticed the growth late last year. "She had a lump on her nose and what looked like a scab," says Munson. "I thought that she had rubbed her nose on something and cut it."

Her veterinarian discovered that the "scab" actually was a squamous papilloma, a proliferative and potentially cancerous lesion. "Squamous papilloma is very rare in reptiles," Dr. Ridgeway says. "Rafiki's is the first one I've seen."

Dr. Ridgeway surgically removed the lesion in December 1996 and January 1997, only to see it grow back both times. After lab results determined that the lesion was benign, Dr. Ridgeway decided to try laser surgery.

"I had heard of Dr. Peavy's work at the Beckman Laser Institute," he explains. The Institute is one of the few places in Southern California offering laser treatment for small animals and exotic pets.

Rafiki first was anesthetized. Dr. Peavy then made an incision in Rafiki's nose with the CO_2 laser, and vaporized the growth. The CO_2 laser seals as it cuts, virtually eliminating bleeding. The laser's 0.8 and 0.25 millimeter beams allow for selective tissue removal, especially important given the small size of the iguana's nose.

Afterwards, the pet iguana was kept for observation at Dr. Ridgeway's office overnight; Munson took her home the next day. Rafiki wore a suture for two weeks following her treatment.

The iguana didn't seem to mind the surgery or the suture too much, according to Munson. "She ate just fine when she got home," she says.

Dr. Peavy is pleased that the Institute could help Munson's pet. In the past, he notes that the Institute has aided other unusual patients such as Sid Vicious the boa constrictor, Fauna the kit fox, and Minnesota the Bengal tiger. "It's cases like these that illustrate the value and unique services of our Veterinary Outreach Program." ■

Institute Contributors and Partners

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PRESENTATIONS

Michael Berns, Ph.D., gave the keynote address at the 16th Annual International Congress on Applications of Lasers and Electro-optics in San Diego, Calif.

J. Stuart Nelson, M.D., Ph.D., co-chaired the session "Lasers in Dermatology: Bio-Optics and Treatment of Human Skin" at the meeting of the Optical Society of America (OSA) in Long Beach, Calif.

Petra Wilder-Smith, D.D.S., Ph.D., presented "Irradiation-induced Effects in Vital and Non-vital Root Canal Structures" to the International Endodonic Association in Stuttgart, Germany, and "Therapeutic and Diagnostic Applications of Lasers in Dentistry" to the Fullerton Periodontal Society in Fullerton, Calif.

Bahman Anvari, Ph.D., presented "Epidermal Cooling During Laser Treatment of Cutaneous Hypervascular Lesions" at the International Biomedical Optics Symposium in San Remo, Italy, and "Analysis of Surface Cooling Techniques During Dermatological Applications of Lasers," at the OSA meeting.

Zhongping Chen, Ph.D., addressed "Optical Doppler Tomography: Technology and Applications" and "Optical Doppler Tomography: Imaging the Skin Vasculature" at the OSA meeting, and presented "Imaging *in vivo* Blood Flow Using Optical Doppler Tomography" at the annual meeting of The Engineering Foundation in Snowbird, Utah.

Tatiana Krasieva, Ph.D., presented "Mechanisms of Cell Permeabilization by Laser Microirradiation" to the Seventh Congress of the European Society for Photobiology in Stresa, Italy.

Vasan Venugopalan, Sc.D., presented "A Critical Analysis of Thermal Injury and Laser Resurfacing" at the OSA meeting.

Johannes F. de Boer, Ph.D., presented "Two Dimensional Birefringence Imaging in Biological Tissue Using Polarization-sensitive Optical Coherence Tomography at Bios '97 in San Remo, Italy, and at the OSA meeting.

Jeffrey D. Gross, M.D., presented "Computer-driven Frequency Modulated Photon Density Waves for Reflectance Spectroscopy of Brain Tissue and Tumors" to the First International Congress on Computer Integrated Surgery of the Head and Spine in Linz, Austria.

Andy Dunn, Ph.D., co-chaired two sessions on "Optical Diagnostics for Dysplasia and Neoplasia" at the OSA meeting.

Xunbin Wei, Ph.D. candidate, presented "T-lymphocyte Activation Studied with an Optical Trap" at the Cambridge Healthtech Institute Conference in San Diego, Calif.

PUBLICATIONS

Michael Berns, Ph.D., published the chapter "Laser Scissors and Tweezers" in *Laser Tweezers in Cell Biology*.

Yona Tadir, M.D., published the chapter "Laser Physics and Applications in Reproductive Medicine" in *Infertility*.

Bruce Tromberg, Ph.D., published "Non-invasive Measurements of Breast Tissue Optical Properties Using Frequency Domain Photon Migration" in *Philosophical Transactions of the Royal Society London*.

Hong Liang, Ph.D., published "Subcellular Phototoxicity of 5-Aminolevulinic Acid" in *Lasers in Surgery and Medicine*.

Petra Wilder-Smith, D.D.S., Ph.D., published "Visualization and Quantification of Dentin Structure Using Confocal Laser Scanning Microscopy" and "A Novel Approach to Laser Doppler Measurement of Pulpal Blood Flow" in the *Journal of Biomedical Optics*. She also published "The Influence of Laser Parameter Configurations at 9.3 µm on Incisional and Collateral Effects in Soft Tissue" in *Oral Surgery, Oral Medicine, Oral Pathology*, and "Possible Platelet-derived Growth Factor Involvement in Helium-neon Laser-stimulated Wound Healing in Rats" in *Lasers in the Life Sciences*.

Zhongping Chen, Ph.D., published "High-resolution Optical Doppler Tomography for Non-invasive *in vivo* Imaging of Blood Flow" in *Proceedings of the International Society of Photo-optical Engineers*.

Martin van Gemert, Ph.D., published "Twin-twin Transfusion Syndrome" in the *Journal of Reproductive Medicine*.

Xunbin Wei, Ph.D. candidate, published "Antigen Recognition by a T-lymphocyte Studied with an Optical Trap" in *Proceedings of the International Society of Photo-optical Engineers*.

NOTABLES

Bruce Tromberg, Ph.D., served as co-chairman of the annual meeting of The Engineering Foundation in Snowbird, Utah.

Petra Wilder-Smith, D.D.S., Ph.D., was awarded an NIH-Fogerty Institute Fellowship for Collaborative Research for laser irradiation research in Japan.

Zhongping Chen, Ph.D., was promoted to assistant adjunct professor, step II.

Andy Dunn, Ph.D., was awarded a Carcinogenesis Training grant by UCI.

ARRIVALS

The Institute is pleased to welcome the following staff members:

Andy Dunn, Ph.D.
Postdoctoral Fellow

Debbi Gordon, R.N.
LAMMP Coordinator

Rachel Schreiman, C.P.A., M.B.A.
Director of Finance

NEWSBRIEFS

(continued from page 1)

recipient, will apply a novel imaging technique, optical Doppler tomography, to the study of *in vivo* microcirculation.

Additionally, the Institute's grant from the U.S. Department of Energy recently was renewed. The three-year grant, one of four awarded nationally, will provide $1.5 million in support to the Institute's medically-focused interdisciplinary laser program.

EDUCATION IN SPOTLIGHT

Education took center stage this fall at the Institute.

The educational activities began in September when the Institute hosted the National Academy of Engineering's "Frontiers of Engineering," a conference for young, outstanding engineers in academia and industry. The engineers, none over 45, learned about such Institute technologies as optical Doppler tomography and frequency domain photon migration.

When UC Irvine classes resumed, the Institute opened its doors to students of Photomedicine 130A. The undergraduate course, taught by eight Institute researchers including Director Michael W. Berns, Ph.D., focused on the interaction of light and biological material. A second class on clinical applications of light will be offered this spring.

Not one to shirk a full schedule, Dr. Berns also educated students, mostly physicians, of UC Irvine's Health Care Executive M.B.A. Program. The graduate course dealt with technology transfer in the biotechnology and biomedical devices fields.

The fall also found the Institute hosting a "Lasers in Plastic Surgery" symposium for plastic surgeons around the world. Organized by Plastic Surgery Professor Bruce Achauer, M.D., the course provided live demonstrations of laser blepharoplasty, laser skin resurfacing, and laser removal of lesions and tattoos. The symposium was part of a continuing education series offered by the American Society of Plastic and Reconstructive Surgeons. ■

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