LASER
BECKMAN LASER INSTITUTE

IN THE NEWS

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Senator Boxer Visits Institute

The Beckman Laser Institute was recently honored by a visit from Senator Barbara Boxer. Boxer, who represents California in the U.S. Senate, toured the Institute during a day-long visit to Orange County.

While at the Institute, Senator Boxer enjoyed a number of demonstrations, including a patient treatment. The patient, a young woman with a vascular birthmark, was treated using a state-of-the-art laser and imaging system. "We explained to the Senator that our goal is to develop more effective treatment methods," commented Associate Director J. Stuart Nelson, M.D., Ph.D. "Our access to Lawrence Livermore National Lab technologies, developed for defense purposes and previously classified, has really contributed to our work on understanding the optical properties of human skin in general, and port wine stain birthmarks in particular."

Senator Barbara Boxer with Institute Veterinary Director Dr. George Peavy during her visit to the Beckman Laser Institute.

During her tour, Senator Boxer was not just an observer. Under the direction of Veterinary Director Dr. George Peavy, Senator Boxer performed "laser surgery" on wooden tongue depressors. "She demonstrated a strong aptitude for it," commented Dr. Peavy. "Should she decide to retire from politics, we'll have a job waiting for her."

The Senator concluded her visit by making a few remarks and answering questions for a small gathering of Institute supporters and University officials. "Your work," she commented, "is evidence that defense conversion can benefit us all through major advances in medical technology."

Institute Director Michael W. Berns, Ph.D., summed up the visit: "We were honored that Senator Boxer had the chance to learn about our innovative work with defense technologies." ■

Newsbriefs

PHOTONIC INCUBATOR

The Beckman Laser Institute has proposed to establish an innovative Orange County-based Incubation/Incubator Consortium (I^2C) to utilize defense photonic technologies (lasers, optics, detectors, etc.) in the development of new biomedical systems for the diagnosis and treatment of disease.

The project has been formally proposed to the Economic Development Administration, U.S. Department of Commerce. In addition, the Office of Strategic Technology of the California Trade and Commerce Agency and UC Irvine have both agreed to provide matching funding.

The proposed consortium should result in: (1) the founding of new biotech businesses; (2) the invention of new products; (3) the creation of new jobs; and (4) the retraining of displaced defense workers.

(Continued on page 8)

Scientists Must Communicate

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

University professors no longer live in an "Ivory Tower." We have an obligation to communicate. If we don't communicate, we don't deserve to benefit from taxpayer support—as we all do—to conduct our research.

Communication can be both a challenge and a real pleasure. For example, during Fall Quarter 1995, the Institute's senior scientists team-taught a new undergraduate course in UC Irvine's School of Biological Sciences entitled "Photomedicine." It has been fun for us to try to convey often complex ideas to young, wide-eyed students. And it was rewarding to see a near-perfect turnout at every lecture.

Teaching

Teaching is a major channel of communication for us, and sending our undergraduate and graduate students, postdocs, and visiting scientists out into the world gives the Institute a world-class perspective and visibility *(see our Researcher Profile, page 6)*.

Training courses for working physicians, veterinarians, and nurses help move practical laser expertise into the medical community *(see our Newsbrief on Institute Education Programs, page 8)*. What can be more effective than actually demonstrating how to cut a chromosome with a laser beam, or showing off one of our patients who has had a birthmark removed? Truly, this form of dissemination is both powerful and highly satisfying.

Sharing Our Research

Another enjoyable challenge is sharing our latest research. Of course, reporting the results of our work to colleagues around the world through journal articles and presentations at meetings is the responsibility of any scientist, but conveying the excitement of research applications to the general public is one of the special rewards of working at the Institute *(see "Laser Genetic Surgery," page 5)*.

What can be more exciting than showing the public how we can use sophisticated laser technologies to treat a pet kitten, racehorse, or exotic zoo animal? *(see "Veterinarians Laud Laser Education," page 4)*

Through our newsletter and the bimonthly *Spectral Flash* (actually stimulated by Institute Board member George Argyros), we have the channels to present science to our supporters and collaborators. We thank you, George, for challenging us to answer: "What are the most exciting projects going on at the Institute?"

Our annual open-house helps keep friends and supporters informed of our many activities. Numerous tours give our Support Group members, friends of our Board, corporate partners, and members of the general public an understanding of what we do *(see our cover article, "Senator Boxer Visits Institute")*.

Two-Way Communication

At the outset of this column, I spoke of scientists' obligation to communicate with the public. However, after writing for, speaking to, and meeting with the Institute's vastly different audiences, perhaps I should speak not only of the *responsibility*, but of the *privilege* of communication.

I believe that putting ideas into lay terms gives scientists a valuable "big-picture" perspective on their own work. And it may be just as crucial for the future of scientific research in the current political climate for scientists to receive feedback from the public as for the public to understand what we do.

So, let me take this opportunity to invite you to help us improve our two-way communication with you. We look forward to hearing your thoughts. ■

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Getting Past the Hype on Skin Resurfacing

On March 27, 1995, laser skin resurfacing received a huge boost when Geraldo Rivera had his crow's feet erased on national TV. After a few smokelike puffs, a residue of white ash was wiped away revealing smooth, tight skin.

It should be no surprise that such a bravura performance created a veritable frenzy for the procedure among the program's viewers and added to the snowballing hype already surrounding laser skin resurfacing.

"Unfortunately, TV has trivialized the whole process and made it seem like magic," observes Dr. Jay Applebaum. Like other physicians performing this procedure, he feels that patients need a realistic sense of what skin resurfacing can do and what is involved in recovery.

Dr. Nissan Pilest explains the skin resurfacing procedure to a patient.

Real Advantages

Hype notwithstanding, there are very good reasons why patients and physicians are excited about laser skin resurfacing.

As Joyce Zeiler, Nurse Director, explains, "In our experience, laser skin resurfacing compares very favorably to dermabrasion and chemical peels to remove wrinkles, acne scars, and other facial blemishes. Treatment is fast, recovery is comparatively quick, and the results are as good as or better than other methods."

"A bloodless procedure, laser resurfacing is less destructive than either chemical peels or dermabrasion," explains Dr. Bruce Achauer. He has given up other methods because of side effects like permanent skin discoloration in favor of laser resurfacing.

Dr. Richard Weiss agrees. "Prior to the introduction of this technology," he explains "it was not possible to treat wrinkles in certain areas. The laser provides a new level of precision and control."

The laser procedure carries yet another advantage. As Dr. J. Stuart Nelson, the Institute's Associate Director, explains that "heat produced by the laser actually causes a certain amount of collagen shrinkage in the area treated, which has the effect of tightening the newly revealed skin."

But It's Not Magic

For all of its advantages, patients should understand that laser resurfacing has its limits and moderate their expectations accordingly. Collagen shrinkage caused by the laser's heat will tighten the skin but is not a substitute for a full face lift.

"Patients shouldn't expect to look twenty years old," cautions Dr. Vandana Nanda. "This is not a lifting procedure and won't help deep wrinkles."

TV tends to give the impression that the transition from "before" to "after" is instantaneous. How about skin resurfacing in the afternoon and then dinner and dancing in the evening? "Unfortunately, this is not realistic," notes Dr. Applebaum. "Laser resurfacing is not a trivial procedure and it has a lot of the same healing and care requirements as other methods."

"The postoperative recovery period is significant," explains Dr. Achauer. "People need to be well prepared for this—there's a lot of skin care that needs to be given."

Seven to ten days after the procedure, patients will experience significant redness, along with possible scabbing and oozing. After about ten days, patients may apply makeup to cover up a pinkness that could persist for one to five months.

The Outlook Is Good

It will be several years until the long-term effects of laser skin resurfacing can be evaluated.

At this point, though, physicians remain excited about laser resurfacing for its considerable advantages over other techniques. The procedure is more accurate and less traumatic, recovery is less involved, the results are equal or superior, and the cost is comparable.

Many of our plastic surgeons and dermatologists perform this procedure. Please contact the Institute's Clinic at (714) 824-7997 for more information or to arrange a free consultation. ■

Veterinarians Laud Laser Education

Southland veterinarians have nothing but praise for the laser education they have received as part of the Institute's Veterinary Outreach Program (VOP).

While most medical laser systems are too expensive for individual veterinary practices to own, access to this technology through the Institute is helping animal patients and at the same time helping to advance the knowledge and application of lasers in biomedicine.

For Dr. John Hamil of Laguna Beach, the VOP offers veterinarians access to "equipment and techniques that simply would not be available otherwise." Lasers may be the only treatment for some patients and the Institute is the one of the few places in the nation where veterinary practitioners can receive training and support.

His VOP experience gave Dr. Keith Richter an "increased awareness of the expertise of the individuals at the Institute." Dr. Alexander Werner, a Veterinary Dermatologist from Studio City who received laser training at the Institute, agrees: "The more vets learn about lasers the more likely they'll be to use one."

Vets agree that the Veterinary Outreach Program is a win-win relationship for animals and people since it furthers research while treating naturally occurring conditions.

Dr. Mona Rosenberg, a Veterinary Oncologist in Los Angeles, is glad that "there are laser centers around the country to which veterinarians have the ability to refer patients who would benefit from this technology."

Veterinary Director Dr. George Peavy demonstrates the argon-pumped dye laser to Dr. Jennifer Burke (middle) and technician Rosemary Moe.

Dr. Vicki Valdez of Orange agrees and urges even more outreach to vets. "Somehow, we need to get the word out so that people know the benefits of this treatment and that it is economically feasible."

As the Institute's Veterinary Director Dr. George Peavy puts it, "veterinarians can become valuable sources of clinical information for researchers and ambassadors of laser medicine to the public." ■

Industrial Associate Profile: Carl Zeiss, Inc.

Established to provide corporations with a window into the evolving world of laser biotechnology, the Beckman Laser Institute's corporate relations program offers companies a formal affiliation with the Institute which allows these firms to conduct joint research projects and tap into the Institute's expertise in biomedicine.

Carl Zeiss, Inc., was one of the first companies to join the Institute's Industrial Associates Program. "I began working with Zeiss more than 15 years ago," explains Institute Director Michael W. Berns, Ph.D. "It seemed natural that this collaboration would become formalized through Zeiss becoming an Industrial Associate."

Carl Zeiss, Inc., located in Thornwood, New York, is the U.S. subsidiary for the German-based company, which was founded in 1846 as an optical workshop to produce high-quality microscopes. Today, Carl Zeiss has worldwide instrument sales of $1.5 billion and employs 17,000 employees.

Zeiss offers a broad range of instruments from laboratory and research microscopes, to complete microscope systems, surgical microscopes and ophthalmic lasers.

Institute researchers are working with Zeiss on the development of a new workstation combining confocal high resolution imaging with trapping and cutting laser beams. Visualization in three dimensions, manipulation and dissection at the submicron level of cellular components open exciting new applications, particularly in the study of live cells or tissues.

"Our affiliation with the Institute has been mutually beneficial towards the development and testing of some of these promising applications," comments Ernst Keller, Consultant for Product Technology at Carl Zeiss. ■

New Frontiers in Laser Genetic Surgery

Since its inception in 1979, more than 700 researchers from around the world have utilized the Laser Microbeam and Medical Program (LAMMP) facility. Jointly sponsored by the National Institutes of Health (NIH) and the University of California, this user facility boasts powerful lasers coupled to microscopes and computers.

This Fall, LAMMP can also boast two new researchers along with an exciting new project with potential implications for the fields of human genetics and cell biology.

New People and Research

The researchers, Professor Barbara Hamkalo and postdoctoral researcher Al Jasinskas, come from UC Irvine's Department of Molecular Biology and Biochemistry. They join Institute Director Michael Berns, Ph.D., and Wei He, a graduate student, in their ongoing work on subcellular microsurgery at the LAMMP facility.

Their current project involves research into genes in the chromosome region known as the centromere. The LAMMP collaborators believe that this area may hold the key to the process of chromosome separation, which goes awry in many forms of cancer.

High-Risk, High-Impact Research

Professor Hamkalo explains that it is often difficult to obtain funding for projects such as this because they are "high-risk, high-impact": no guarantees of success, but huge implications. For her project, Institute support is crucial.

The centromere is where chromosomes separate from each other at cell division. Until now, it was thought that the genetic information in this area was mostly meaningless "junk DNA." And, before lasers, scientists had a difficult time targeting the relevant sections of the chromosome containing the DNA sequences.

But the LAMMP facility gives the Hamkalo/Berns team a special advantage.

"The facility here is absolutely unique," Professor Hamkalo explains, "because it gives us the capability to do sophisticated microsurgery with colleagues who have a genuine desire to collaborate."

Institute researchers (from left) Barbara Hamkalo, Michael Berns, Al Jasinskas, and Wei He exploring genes in a crucial area of the human chromosome.

Now, using a microscope-focused laser beam it is possible to selectively visualize the desired region of a chromosome, focus the laser beam onto that region, cut out the desired piece of the chromosome, collect and pool cut fragments, and then amplify and subsequently determine the DNA sequences in these genes using a biochemical method called PCR (also used in the OJ Simpson trial).

The joint project will attempt to determine if there are active genes in the centromere and, if so, to do specific DNA sequencing on them. The research team will use the laser microbeam, called "laser scissors," to cut out the centromere regions of chromosomes, pool the fragments, and subject the pooled fragments to PCR methods and DNA sequencing.

Research Comes Full Circle

In 1968, then-future Institute Director Michael Berns began probing cells with laser beams through the microscope. Later that year, he was successful in showing for the first time that a focused laser beam could be used to "carve out" a small (less than a micron) region from the chromosome of a living cell thus founding the field of laser subcellular genetic microsurgery.

Today, Dr. Berns' student, Wei He, in collaboration with Professor Moyra Smith of the UC Irvine Department of Pediatrics, uses the technique developed in 1968 to target a region of chromosome number 9 that plays a key role in the disease Tuberous Sclerosis.

This disease occurs with a frequency of one in 10,000 births and results in tumors in multiple organs that can have fatal consequences. The location of the genes and the DNA sequences responsible for the condition remain unknown.

"Professor Hamkalo, Professor Smith and Dr. Jasinskas bring invaluable expertise in molecular biology to the LAMMP facility," Professor Berns concludes. "With their help and collaboration, we hope to accelerate our progress towards using the laser to probe, study, and eventually sequence important genes." ■

Yagang Liu: Ready for Business

Until recently, Yagang Liu, Ph.D., was a graduate student at the Institute. That is, until he became the most recent link connecting the Institute and long-time Corporate Affiliate Beckman Instruments, Inc. Like Ken Strahs and Tsong-Tseh Tsay before him, Yagang has moved from the Institute's labs to a position as a research scientist at the Fullerton, California, firm.

"Yagang continues a strong tradition of collaboration and exchange with Beckman Instruments that has been one of the Institute's most productive corporate relationships," explains Institute Director Michael Berns, Ph.D.

According to Dr. Berns, "ever since the founding of the Institute, this relationship has given our researchers valuable support while affording Beckman Instruments a dynamic connection to the latest advances in laser biotechnology. Yagang's move will only serve to strengthen this valuable connection."

Yagang came to the Institute after receiving his M.S. in physics from the Shanghai Institute of Optics and Fine Mechanics in China. While completing his Ph.D. in Electrical and Computer Engineering at UC Irvine, Yagang worked with Professor Greg Sonek in the field of bio-sensing technology.

"I'm very proud to have had Yagang as a student," comments Professor Sonek. "He has made original and innovative contributions to the biomedical field."

"I will always value the exposure to cutting-edge research and the opportunity to work with top scientists at the Institute," Yagang explains. "My time there has prepared me well to work in industry." ■

Yagang Liu, Ph.D., at work in his lab.

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PRESENTATIONS

Institute Director **Michael Berns, Ph.D.,** addressed the Optical Society of America (OSA) Annual Meeting in Portland, Oregon. He spoke on "Confocal Ablation Trapping Microscope System: CATS."

Yona Tadir, M.D., spoke at the Sixth Annual Obstetrics and Gynecology Symposium in Orange, CA on "Photomedicine in the Female Genital Tract." He presented "Endometrial Ablation Using 5-Aminolevulinic Acid: Various Experimental Models" at the Photo-dynamic Therapy Symposium in Leeds, England. He also spoke on "The Future of Gynecologic Endoscopy" at the Biannual Meeting of the International Society of Minimally Invasive Therapy in Portland, Oregon.

J. Stuart Nelson, M.D., Ph.D., was an invited speaker at the 3rd Annual Harvard Medical Symposium in Bermuda. He spoke on "Controversies in Cutaneous Laser Surgery." He was also invited to speak on"Recent Advances in the Clinical Management of Hypervascular Dermatoses" at the 10th International Symposium on Recent Advances in Plastic, Cosmetic and Dermatological Laser Surgery, in Cambrils, Spain.

Bruce J. Tromberg, Ph.D., spoke on "Photon Migration Spectroscopy for Physiological Monitoring and Functional Imaging" at the OSA Annual Meeting held in Portland, Oregon.

Tom Milner, Ph.D., presented "Optical Doppler Tomography" at the European BIOS Meeting in Barcelona, Spain.

Curtis Chapman, Ph.D., presented "Measurement of Transient Heating in Cells During Free-Electron Laser Microirradiation" at the CLEO/Pacific Rim 1995 conference in Chiba, Japan. He also gave a talk on "FEL Pump-Probe Microscopy" at the Free Electron Laser Research Institute in Osaka, Japan.

PUBLICATIONS

J. Stuart Nelson, M.D., Ph.D., published "Dynamic Epidermal Cooling During Pulsed Laser Treatment of Port Wine Stains: A New Methodology with Preliminary Clinical Evaluation" in *Archives of Dermatology*. He also published "Laser Pulse Duration Must be Approximately Equal to the Estimated Blood Vessel Thermal Relaxation Time for Successful Photothermolysis of Blood Vessels" in the journal *Lasers in Medicine and Science*.

Bruce Tromberg, Ph.D., published "Characterization of Tissue Optical Properties Using Photon Density Waves" in *Comments on Molecular and Cellular Biophysics*. He also published "Cell Damage by Near-IR Microbeams" in *Nature*.

Tom Milner, Ph.D., published "Imaging Laser Heated Subsurface Chromophores in Biological Materials: Determination of Lateral Physical Dimension" in *Physics in Medicine and Biology*. He also published "Non-Contact Determination of Thermal Diffusivity in Biomaterials Using Infrared Imaging Radiometry" in the *Journal of Biomedical Optics*.

NOTABLES

J. Stuart Nelson, M.D., Ph.D., was appointed to the Board of Directors of the American Society for Lasers in Medicine and Surgery. He was also appointed Co-Editor of the journal *Lasers in Medical Sciences*.

Bruce Tromberg, Ph.D., has been promoted to Associate Professor, Departments of Physiology Biophysics, and Surgery at UC Irvine.

Matthew Brenner, M.D., was promoted to Associate Professor of Medicine, UC Irvine.

Bruce Achauer, M.D., Adjunct Professor of Surgery, has been elected Director of the American Board of Plastic Surgery.

Tom Milner, Ph.D., was promoted to Assistant Professor of Surgery, UC Irvine. He also was awarded a three year grant from the Whitaker Foundation to study "Precision Dosimetry for Laser Surgery."

Zhongping Chen, Ph.D., is an assistant researcher who will be investigating Optical Low Coherence Tomography for medical imaging and diagnosis. Zhongping received his Ph.D. from Cornell University in Applied Physics.

Digant Davé, Ph.D., is the New Star Postdoctoral Fellow. He earned his doctorate in Electrical Engineering from Texas A&M University. Digant will research Optical Low Coherence Reflectometry and collagen shrinking.

Josh Fishkin, Ph.D., is a postdoctoral fellow performing research in breast cancer detection using photon migration. Josh comes to us from the University of Illinois at Urbana-Champaign, where he received his Ph.D. in Physics.

Derek Smithies, Ph.D., is the Packard Research Fellow conducting research in Infrared Tomography. Derek comes to us from the University of Canterbury, Christchurch, New Zealand, where he earned his doctorate in Physics.

Erik Curren, Ph.D., has joined our staff as Manager of Research Development and Publications. Erik received his Ph.D. in English from UC Irvine. He edits the Institute's newsletter and Internet publications, and coordinates the preparation of research grants.

Laurie Newman, A.H.T., is the Institute's new Animal Health Technician. Laurie comes to us from the Hospital of the Good Samaritan, Los Angeles. She assists with veterinary treatments, maintains the Veterinary Operating Facility, and coordinates animal use for research projects. ■

NEWSBRIEFS

(continued from page 1)

The proposed project is not a classic incubator (think tank) in which new space is renovated (or built) and essentially made available to "tenants." Instead, the project will take existing Institute facilities, scientific and medical expertise, and extensive corporate contacts (both manufacturing and financial institutions), and with a modest building expansion, the I^2C will provide a resource for technology transfer and new business development in the area of medical photonics.

The proposed facilities expansion includes an engineering development lab, biomedical testing lab, and a clinical applications suite, along with program office and conference space.

The expansion will be built immediately adjacent and attached to the Institute's patient and veterinary treatment facilities. A totally unique environment will be created, one that should be extremely attractive to the private sector for medical device development.

"This project will support the expansion of the Institute into an area of increasing national importance—the development of high tech medical devices—to provide more effective diagnosis and treatment of disease that will hopefully be more effective yet less costly than current methods," comments Institute Director Michael W. Berns, Ph.D. "We are already working with many companies, including defense contractors, who will be interested in becoming involved with this Photonic Incubator."

Michael Berns, Arnold O. Beckman, and David Packard (from left) at a recent Board of Directors' meeting.

EDUCATIONAL SERVICES

As part of its ongoing programs, the Institute offers a variety of educational opportunities. These include two lecture series which have run throughout the Fall: a "Photomedicine" course for UC Irvine undergraduates *(see Director's Message, page 2)*, and a noontime seminar series featuring a variety of interesting research topics.

As part of its mission to provide physician training and education, the Institute also offers a variety of courses to medical practitioners, including advanced training and preceptoring.

The Institute has begun free public seminars. The first of this series discussed recent advances in laser ophthalmology. In addition, the Institute now offers educational materials on the Internet at **http://www.bli.uci.edu.**

For more information on any of these programs, please call (714) 824-4111. ■

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