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Imaging For Non-Invasive Melanoma Diagnosis

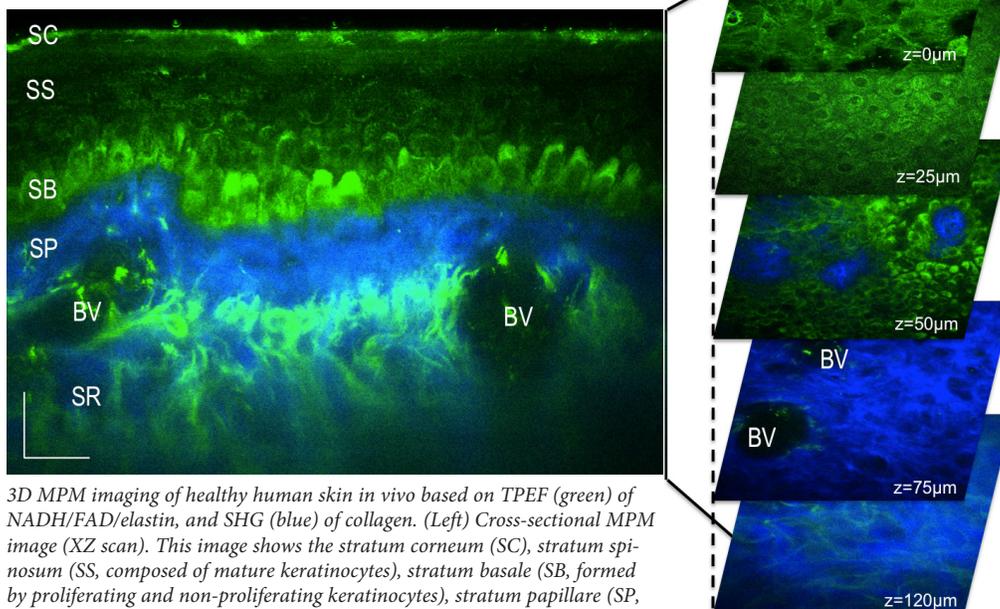
Malignant melanoma is the most deadly form of skin cancer and responsible for the vast majority of skin cancer-related deaths. The current approach for diagnosing melanoma is based on biopsy and histopathological

examination, the same method used 100 years ago. This procedure is invasive and the selection of a biopsy site is highly dependent

upon the physician's experience. A new approach for bedside, non-invasive diagnosis of melanoma was recently described by researchers at the Beckman Laser Institute (BLI) in a recent publication, "Distinguishing between benign and malignant melanocytic nevi by in vivo multiphoton microscopy," by M. Balu, K. M. Kelly, C. B. Zachary, R. M. Harris, T. B. Krasieva, K. König, A. J. Durkin and B. J. Tromberg (*Cancer Research*, published online March 31, 2014).

This approach is based on laser-scanning multiphoton microscopy (MPM). MPM "sees" through the skin surface by generating 3D images with sub-micron resolution. It provides real-time, label-free images of epidermal cells and elastin fibers via two photon excited fluorescence (TPEF) and collagen fibers via second harmonic generation (SHG). The microscope used in this study is a novel clinical instrument, the "MPT-flex," developed by JenLab,

(*Melanoma Imaging on p. 5*)



3D MPM imaging of healthy human skin in vivo based on TPEF (green) of NADH/FAD/elastin, and SHG (blue) of collagen. (Left) Cross-sectional MPM image (XZ scan). This image shows the stratum corneum (SC), stratum spinosum (SS, composed of mature keratinocytes), stratum basale (SB, formed by proliferating and non-proliferating keratinocytes), stratum papillare (SP, exhibits papillary collagen), blood vessels (BV), and stratum reticulare (SR, contains dermal collagen and elastin). Scale bar is 20 μm . (Right) En-face MPM images (XY scans) of skin at different depths corresponding to the cross-sectional image on the left.

Honors and Awards

Henry Hirschberg, M.D., Ph.D.

BLI Research Professor Henry Hirschberg has been awarded a 2-year consortium grant between UC Irvine and UC Davis from the National Institutes of Health. Drs. Laura Marcu and Simon Cherry (UC Davis) and Dr. Hirschberg (UC Irvine) are principal investigators of the grant,

"Photodynamic therapy mediated by Cerenkov light from radiopharmaceuticals."

Petra Wilder-Smith, D.D.S.

BLI Dental Director Petra Wilder-Smith has received a grant from MedActive Oral Pharmaceuticals for "An efficacy study of MedActive oral relief products in the treatment of xerostomia induced by acute radiation exposure in rats."

Bernard Choi, Ph.D.

Associate Professor of Biomedical Engineering Bernard Choi has received a one year grant from the UC Irvine School of Medicine Committee on Research and Graduate Academic Programs for "Measurement of neonatal microvascular hemodynamics using a clinic-friendly blood-flow imaging device."

(*Honors and Awards on p. 5*)

Three Anecdotes

by Michael W. Berns, Ph.D.

Arnold and Mabel Beckman Professor
Co-Founder, Beckman Laser Institute

Arnold O. Beckman, AOB to his close friends, liked to tell stories. Not fibs, but real events, real situations that confronted him during his life. One of the first he told me was about having an accident where he collided with another car in an intersection on New Year's Day. It was a fender-bender—no one was hurt. He walked to a phone booth, called the AAA, and got a young man on the phone who asked for his card number. When AOB read 000008, the reply was, "That can't be correct. Everyone with those numbers has passed away." If you are ever in the BLI library, check out AOB's 90th birthday card and picture him telling this story with the grin he is wearing in the sketch on that card.

Another story he liked to tell was about integrity. A young boy asks his father what the fuss is about "integrity." "I'll explain," says the father. "A man pays ten dollars for some items in the

hardware store. He hands the clerk a crisp bill and leaves. When the clerk proceeds to place it in the cash register, he realizes it's really two tens stuck together. So he has a dilemma that gets to the heart of 'integrity.' Should he share his good fortune with the other clerk in the store, or keep both tens for himself?"

The third story is not really a "story" because it has to do with the way in which AOB mentored me. It had to do with what appeared to him (which I now know was true) that I was continually asking him for more money to run the BLI after he had already given several million dollars to build and equip the Institute. In a 1988 letter, he said: "The Laser Institute, to remain viable and progressive, must have an efficient fund-raising capability ... it is essential, therefore, that you establish an adequately broad support base and develop an effective fund-raising organization. After four years, that organization does not yet exist." If that was not already a blow to my ego, he went on to write: "You state you are frustrated because so much of your time is spent trying to raise funds. I suspect that you are adding time spent worrying about fund-raising to the time

spent on actual fund-raising." That particular comment speaks volumes to AOB's acerbic but good natured humor. He continued: "If you have, in fact, solicited a large number of potential donors, the question arises – 'Why have you been so ineffective?' There is a strong tendency, of course, to blame donors for an unresponsive attitude. Don't make that mistake!" He then proceeded to advise me to "examine critically" the methods I used to approach donors. His final advice was for me to get professional help (not psychiatric!), which I did, and we eventually raised another several million dollars, which AOB then matched, as that was the way in which he felt his money should be leveraged—through matching grants. This interaction was one of the most profound and memorable of the many we had over 14 years.

I share these "stories" because, to most of you, "Beckman" is just a name on the building, a name on a website, or on our letterhead; perhaps now you know a little bit more about the generous man behind the name. ■

Newsbriefs

Sixth Annual Allan R. Oseroff Photomedicine Lecture



Dr. R. Rox Anderson

The sixth annual Allan R. Oseroff Photomedicine Lecture held at the Calit2 Auditorium, UC Irvine, was given by R. Rox Anderson, M.D., on June 5, 2014. Dr. Anderson, Professor of Dermatology at

Harvard Medical School, spoke on "Basic strategies for target-selective optical therapy: an ode to Allan Oseroff." The annual Photomedicine Lectureship was established by the Beckman Laser

Institute (BLI) in recognition of Dr. Oseroff's outstanding contributions to the BLI through his participation on the Laser Microbeam and Medical Program (LAMMP) external Scientific Advisory Board for more than 10 years. This year's lecture was co-sponsored by the Chao Family Comprehensive Cancer Center, Institute for Clinical Translational Science, California Institute for Telecommunications and Information Technology, Department of Dermatology, and Department of Biomedical Engineering.

Named to Editorial Board

Dental Director Petra Wilder-Smith has been named to the Editorial Board of *Photomedicine and Laser Surgery*.

San Diego Zoo Gets a Close-up View of Sperm Cells

In the lab of Beckman Laser Institute (BLI) co-founder Michael Berns, laser traps are used to study sperm motility and fertility in endangered species. The geometry of the head of the sperm is a key element when using the laser trap to measure the force with which a sperm swims. You can see in various species that the shape is not oval, like in humans, and thus, the interpretation of the amount of force exerted by the trap has to be modified according to sperm head geometry. This is a very challenging mathematical calculation.

Recently, expanding on his long term collaboration with the San Diego Zoo, Dr. Berns volunteered to provide scan-

(Newsbriefs continued on p. 4)

FlowMet



FlowMet device clips onto the finger.

As reported in the Summer 2013 issue of the Beckman Laser Institute newsletter, then graduate students Bruce Yang, Sean White and Tyler Rice won First Place in the UCI Business Plan Competition sponsored by The Paul Merage School of Business for creating a non-invasive medical device which clips onto the finger that optically measures blood flow in peripheral tissue. They were awarded \$15,000 to help develop and market the device.

Fast forward to one year later: the three have earned their Ph.D. degrees, and the company they created, Laser Associated Sciences, is based in Irvine. The patent-pending optical device, FlowMet, provides real-time blood-flow speed that could help doctors detect blood flow blockages that may signal vascular illness. The prototype is less expensive and more practical than similar existing machines. The FlowMet costs them about \$400 to produce, and they hope to sell it for \$5,000 a unit which is significantly less than other machines, which range from \$25,000 to \$50,000, that can perform similar functions. With several prototypes made, the three are no longer just pure scientists.

As entrepreneurs, their focus has shifted to raising money and attracting investors in order to get a return on their investment, and they have an advisory



FlowMet inventors (from left to right) Tyler Rice, Sean White and Bruce Yang.

board which helps them with marketing and business development of their device, a perk from winning the competition. They recently entered the California Dreamin' Business Plan Competition at Chapman University and placed as a finalist which entitled them to \$30,000 in cash and equity.

Their company was highlighted in the Business section of the *Orange County Register*, April 5, 2014 ("Device developers learn marketing side"). ■

Ph.D. Recipients

Barbara Alcaraz Silva, Ph.D.



Barbara Alcaraz-Silva (right) with Prof. Michael Berns.

Barbara Alcaraz Silva defended her thesis, "Characterization of specialized telomere responses to DNA damage in mitosis," on May 19, 2014. Barbara worked in the lab of Dr.

Michael W. Berns and has accepted a postdoctoral position with Dr. John Murnane, Department of Radiation Oncology, at UC San Francisco where she will be studying the repair mechanism telomeres in stem cells.

Jonathan Compton, Ph.D.

Jonathan Compton defended his thesis, "High-throughput microcavitation bubble induced cellular mechanotransduc-

tion," on March 6, 2014. Jonathan worked in the labs of Drs. Vasan Venugopalan and Elliot Botvinick. He is seeking a job in the biotechnology industry.



Jonathan Compton (center) with Profs. Elliot Botvinick (left) and Vasan Venugopalan (right).

Soroush Mirzaei Zarandi, Ph.D.



Soroush Mirzaei Zarandi (right) with Prof. Bruce Tromberg.

In expectation of defending his thesis in December, Soroush walked through graduation. He works in the lab of Drs. Bruce Tromberg and Albert Cerussi.

Richa Mittal, Ph.D.

Richa Mittal defended her thesis, "Application and miniaturization of linear and nonlinear Raman microscopy for biomedical imaging," on June 3, 2014. Richa worked in the labs of Drs. Eric Potma and Petra Wilder-Smith. She is seeking a postdoctoral research position at Michigan State University.



Richa Mittal (right) with Prof. Eric Potma.

Ryan Spitler, Ph.D.

Ryan Spitler defended his thesis, "Multimodal wound healing acceleration," on April 8, 2014. He worked in Dr. Michael Berns' lab and has accepted a postdoctoral position at Stanford University. ■

Newsbriefs *(cont'd from p. 2)*

ning electron microscope (SEM) images of sperm from a wide range of species obtained from the San Diego Zoo and San Diego Zoo Safari Park. The SEM images can reveal morphological features not visible with two-dimensional microscopic imaging. In a blog written by Nicole Ravida, entitled Sperm Atlas 2.0, she describes the extensive steps taken by BLI electron microscopist, Leacky Liaw, in order to produce the final images. To view some examples of the extraordinary detail captured by SEM, go to <http://blog.sandiegozooglobal.org/2014/01/22/sperm-atlas-2-0/>.

Farewell to Dr. Howard Schlossberg



Dr. Howard Schlossberg (center) with BLI Director Dr. Bruce Tromberg (right) and BLI Military Medical Photonics Program coordinator Dr. George Peavy (left).

Air Force Office of Scientific Research (AFOSR) Program Manager, Dr. Howard Schlossberg, has been a long-time administrator of the Military Medical Photonics Program (formerly the Medical Free Electron Laser Program) that supports laser biomedical research at the Beckman Laser Institute (BLI). In recognition of his retirement and appreciation of his scientific contributions, leadership, administration, guidance, and mentorship in the advancement of biophotonics, biomedical optics and photomedicine, the faculty of the BLI made a donation of \$1,000 to the OSA Foundation that was matched by The Optical Society (OSA). The mission of the OSA Foundation is to help students as they move through advanced degree programs and become active members of research and engineering communities around the globe. The donation certifi-

cate was presented at a symposium in honor of Dr. Schlossberg at the Conference of Lasers and Electro-Optics (CLEO) on June 8, 2014, in San Jose, CA.

BLI-Korea 2nd Annual Symposium

Faculty from the Beckman Laser Institute traveled to Seoul, Korea, to attend the 2nd Annual Symposium of the Beckman Laser Institute-Korea (BLI-Korea). Drs. Elliot Botvinick, Bernard Choi, Zhongping Chen and Brian Wong also visited the BLI-Korea research center located at Dankook University in Cheonan where they were hosted by ChungKu Rhee, M.D., founder of the Dankook Medical Center and former Director of Dankook University Medical Laser Research Center Korea.

BioPhotas Collaboration

BioPhotas, Inc. (Tustin, CA) is working with Dr. Michael Berns and supported a fellowship for graduate student Ryan Spitler in a collaborative project with Dr. Gerry Boss at UC San Diego to develop a new drug, Nitrosyl-cobinamide (NO-Cbi). Formulations of this drug in combination with low level light therapy (LLT) are being tested with the goal of acceleration of the wound healing process as part of the Department of Defense Medical Photonics Program administered by the Air Force Office of Scientific Research. The UCI Office of Technology Alliances is in negotiation with BioPhotas for an option to license this technology. In addition, a full patent application has been filed with the United States Patent and Trademark Office.

BLI Co-Founder Wins Writing Award

A memoir written by Beckman Laser Institute (BLI) co-founder, Michael W. Berns, was selected as the 1st place winner in the "unpublished memoir" category



BLI-Korea visit: (from left to right) Drs. Elliot Botvinick, Zhongping Chen, ChungKu Rhee, Brian Wong and Bernard Choi.

at the 20th annual awards of the San Diego Book Awards Association (SDBAA) at a ceremony held in Del Mar, CA, on June 21, 2014. With 200 people in attendance, the following was read to the audience as an introduction to the memoir.

Michael Berns grew up in the New York City area and received his Master's and Ph.D. at Cornell University. He has taught and conducted biomedical research for the past 42 years at the University of California, Irvine, and San Diego. He met his wife, Roberta, in high school, and they have been together ever since. Title: *re-fyooz-nik (refusenik)* *re-fyooz-nik* is about an American boy who struggles with the demons of being an out-cast as he matures and gains success as a scientist. During a trip to the U.S.S.R. in 1979, trailed



Dr. Michael Berns with his writing award from SDBAA.

by the KGB and on a special mission for the CIA, he visits with a refusenik family. He sympathizes deeply with the plight of Jews in a country that does not want them but won't let them go. The experience triggers a replay of his own life of abandonment, anti-Semitism, and refusal.

Founded in 1994, the SDBAA honors the best published and unpublished manuscripts by San Diego County residents each year. ■

Melanoma Imaging *(cont'd from p. 1)*

Inc., Germany. This system is currently the only one of its kind in the U.S.

The goal of the study was to evaluate the ability of MPM to distinguish among pigmented lesions in three groups: common nevi, dysplastic nevi and melanoma. Fifteen pigmented lesions were imaged in vivo (5 for each group) in 14 patients. After the lesions were imaged, biopsies were performed and standard histopathological slides were prepared. The MPM and histologic images were compared and 3 unique optical imaging biomarkers related to TPEF and SHG

signals were used to quantify key histopathologic features. These imaging markers were combined to obtain a numerical “multi-photon melanoma index (MMI).” The MMI scale ranged from 0-9, where 0 and 9 represent the lowest and highest probability of melanoma, respectively. Indices corresponding to common nevi (0-1), atypical nevi (1-4) and melanoma (5-8) were significantly different ($p < 0.05$), suggesting the potential of the method to distinguish between melanocytic nevi in vivo. This study was performed according to an approved IRB protocol (Principal Investigator: Dr. Kristen Kelly).

A more comprehensive study with a larger number of patients is necessary in order to validate the proposed scoring algorithm and evaluate how well MPM technology can distinguish dysplastic nevi from common nevi and melanoma. This could help dermatologists increase the accuracy of their diagnosis for pigmented lesions that fall into the borderline area and minimize the need for invasive biopsies. This was the first clinical translational study of MPM tomography in the U.S. for characterization and diagnosis of benign pigmented lesions and suspected melanoma. ■

Honors and Awards *(cont'd from p. 1)*

Kristen Kelly, M.D.

Professor of Dermatology and Surgery
Kristen Kelly was elected vice-president of the American Society for Laser Medicine and Surgery. She also received a 2-year grant from The Sturge-Weber Foundation for “Vascularized port wine stain skin model for evaluation of cell types in lesion pathogenesis.”

Olubunmi Ajose-Popoola, M.D.



Olubunmi Ajose-Popoola

Resident Physician
Olubunmi Ajose-Popoola received a 2nd place poster award for “Imaging early subglottic edema using three-dimensional Fourier-domain optical coherence tomography: pilot investigations in the New Zealand white rabbit” at the Combined Otolaryngology Spring Meetings held on May 18, 2014, in Las Vegas, NV. Dr. Ajose-Popoola works in the labs of Drs. Brian Wong and Zhongping Chen.

Giriraj Sharma, M.D., M.S.

Postdoctoral Research Fellow Giriraj

Sharma received 1st place in the Charles P. Ferguson Clinical Research Award for “Three-dimensional long-range Fourier-domain optical coherence tomography of the neonatal subglottis” at the Combined Otolaryngology Spring Meetings held on May 18, 2014, in Las Vegas, NV. Dr. Sharma works in the labs of Drs. Zhongping Chen and Brian Wong.



Giriraj Sharma

Barbara Alcaraz Silva, Ph.D.

Barbara Alcaraz Silva received “The Federation of American Societies for Experimental Biology (FASEB)” award to attend the annual meeting of The American Society of Biochemistry and Molecular Biology (ASBMB) from April 26-30, 2014, in San Diego, CA.

Sean White, Ph.D.

Postdoctoral researcher Sean White has received a grant from the American Society for Laser Medicine and Surgery for “Development of clinic-friendly perfusion measurement system to aid in light dosimetry during novel port-wine stain treatment.”

John Biren-Fetz, B.S.

John Biren-Fetz received a travel grant to attend and present at the 2014 Annual

Conference of the American Society for Laser Medicine and Surgery in Phoenix, AZ. John works in Dr. Petra Wilder-Smith’s lab.

Ryan Farraro, B.S.

Graduate student Ryan Farraro, who works in Dr. Bernard Choi’s lab, received a one-year research grant from the American Society for Laser Medicine and Surgery for “Handheld laser speckle imaging system for neonatal care.”

Caitlin Regan, B.S.

Graduate student Caitlin Regan received a one-year research grant from the American Society for Laser Medicine and Surgery for “Laser speckle imaging to determine tooth viability.” Caitlin works in Dr. Bernard Choi’s lab.

Sara Sabokpey, B.S.

Sara Sabokpey, who works in the lab of Dr. Petra Wilder-Smith, received a travel grant to attend and present at the 2014 Annual Conference of the American Society for Laser Medicine and Surgery in Phoenix, AZ.

Daniel Kohanchi

Undergraduate student Daniel Kohanchi received a travel grant to attend and present at the 2014 Annual Conference of the American Society for Laser Medicine and Surgery in Phoenix, AZ. Daniel works in Dr. Petra Wilder-Smith’s lab. ■

BLI Newsletter Staff

Editor: Bruce Tromberg

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ICTS 2014 Interdisciplinary Team Science Award

The UC Irvine Pediatric Upper Airway Modeling and Imaging Team, comprised of Dr. Brian Wong (team leader) and Drs. Zhongping Chen, Said Elghobashi and Gurpreet Ahuja, is the recipient of the 2014 Interdisciplinary Team Science Award given by The Institute for Clinical and Translational Science (ICTS). The team is a transdisciplinary collaboration among several departments at UC Irvine (Otolaryngology-Head and Neck Surgery, Biomedical Engineering, and Mechanical Engineering) as well as Children's Hospital of Orange County. Drs. Wong and Chen are also researchers at the Beckman Laser Institute.

The team integrated optical coherence tomography (Dr. Chen), device design (Dr. Wong), computational fluid dynamics (Dr. Elghobashi), and clinical expertise (Dr. Ahuja) to develop a system to generate real-time 3-D volumetric images of the internal airway structure and estimate airflow dynamics in children. The team evolved from the common goal to develop a means to reliably identify, predict, and manage upper airway obstructive breathing in children. Together they have addressed the problem of designing and constructing a new minimally invasive imaging technology to obtain structural images of the upper airway. Recently, Drs. Wong, Chen, and Elghobashi hosted a workshop with 60 National Institutes of Health (NIH) investigators at UC Irvine where the focus was on functional modeling of the pediatric upper airway. The team has received a multiple PI, NIH R01 grant, along with several other extramural sources of funding, and technology has been successfully translated to clinical studies. As noted by the ICTS, the group exemplifies interdisciplinary teams and the impact on translation of research discoveries into clinical applications and, eventually, clinical practice.

The team was honored at the 6th Annual ICTS Awards Dinner, "People Who Make a Difference in Human Health," on June 27, 2014.

Pediatric Upper Airway Team

Andrew Pollard, Ph.D., Queen's Research Chair in Fluid Dynamics and Multi-scale Phenomena, Cross-appointed to the Department of Mathematics and Statistics, Department of Mechanical and Materials Engineering, Queen's University, Kingston, Ontario, Canada

Nguyen Pham, M.D., Pediatric Otolaryngology, Children's Hospital of Orange County, Assistant Clinical Professor, Department of Otolaryngology-Head and Neck Surgery, School of Medicine

Giriraj K. Sharma, M.D., M.S., Postdoctoral Research Fellow, Department of Otolaryngology-Head and Neck Surgery, School of Medicine

Anthony Chin Loy, M.D., Resident Physician, Department of Otolaryngology-Head and Neck Surgery, School of Medicine

Dmitry Protsenko, Ph.D., Project Scientist, Beckman Laser Institute and Medical Clinic

Frances Lazarow, M.D., Postdoctoral Fellow, Beckman Laser Institute and the Department of Otolaryngology ■

ACRIN 6691 Completes Enrollment

The American College of Radiology Imaging Network (ACRIN) clinical trial ACRIN 6691: "Monitoring and predicting breast cancer neoadjuvant chemotherapy response using diffuse optical spectroscopic imaging (DOSI)," (<http://www.acrin.org/TabID/681/Default.aspx>), was officially closed for patient enrollment on June 30, 2013. Initially begun two years ago, the target enrollment was 60 patients, and the maximum enrollment has been successfully achieved. This multi-center trial will evaluate DOSI technology developed by the Laser Microbeam and Medical Program (LAMMP) at the Beckman Laser Institute and Medical Clinic (BLI).

The primary aim of the ACRIN 6691 trial is to ascertain whether baseline to mid-therapy changes in DOSI measurements can predict pathological response in patients receiving pre-surgical neoadjuvant chemotherapy for breast cancer. The study is a collaboration between ACRIN and the National Cancer Institute's Network for Translational Research in Optical Imaging

(NTROI). A total of seven NTROI clinical sites enrolled 60 study participants: UC San Francisco, Massachusetts General Hospital, University of Pennsylvania, Dartmouth College, MD Anderson Cancer Center at the University of Texas, Boston University, and BLI at UC Irvine. All patients were evaluated using identical handheld DOSI instruments, developed and built at BLI, as well as standard scanning methods and a similar class of chemotherapy and dosing strategies.

As one of only 30 Biomedical Technology Resource Centers funded by the National Institute of Biomedical Imaging and Bioengineering (NIBIB) of the National Institutes of Health (NIH), LAMMP provided personnel and technical expertise for DOSI instrument validation, standardization, and DOSI computational analysis methods. ACRIN biostatisticians analyzed data gathered at each site centrally in accordance with the national multi-center trial format. Trial results are expected to be released by the end of 2014. ■

UROP and SURP Awards

Each academic year, the Undergraduate Research Opportunities Program (UROP) awards fellowships to support noteworthy research during the academic year and SURP awards for the summer. The following undergraduate students working in the labs of BLI faculty were named as UROP Fellows for 2013-2014 and SURP Fellows for 2014.

Mentor: Dr. Michael Berns

Frederique Norpetlian and Yesenia Rocha, “Development of a high-throughput drug discovery system” (UROP).

Mentor: Dr. Elliot Botvinick

Horacio Estabridis, “Fiber matrix analysis with digital micro-mirror device based confocal microscopy and space time image correlation spectroscopy” (UROP).

Thi Tran, “Elucidating the role of matrix stiffness in promoting tumor progression” (SURP).

Janelle Halog, “Analyzing force-extension curves to study biophysical differences in the activation of notch signaling” (SURP).

Mentor: Dr. Albert Cerussi

Jesse Lam, “Development of a laparoscopic-compatible diffuse optical spectroscopy probe” (UROP).

Mentor: Dr. Bernard Choi

Paul Ashkay, “Endoscopic laser speckle imaging system (ELSI)” (UROP) and “Laser speckle imaging for endoscopic applications” (SURP).

Patrick Lo, “High-resolution, depth-resolved imaging of microglia and microvasculature in mouse brain using optical histology” (UROP) (SURP).

Michael Marks, “Development of a turnkey HiLo microscope for quantitative mapping of microvasculature in dorsal window chambers” (UROP).

(UROP and SURP continued on p. 8)

Selected Recent Publications

“Nasal tip support: a finite element analysis of the role of the caudal septum during tip depression” by C. Manuel, R. Leary, D. Protsenko and B. J. Wong in *The Laryngoscope* 124: 649-654, 2014.

“Mechanical analysis of arterial plaques in native geometry with OCT wall motion analysis” by C. Robertson, A. E. Heidari, Z. Chen and S. C. George in *Journal of Biomechanics* 47: 755-758, 2014.

“The development of a fluorescence-based sensor for rapid diagnosis of cyanide exposure” by R. E. Jackson, R. P. Oda, R. K. Bhandari, S. B. Mahon, M. Brenner, G. A. Rockwood and L. B. Alexander in *Analytical Chemistry* 86: 1845-1852, 2014.

“Effect of desiccating stress on mouse meibomian gland function” by J. L. Suhaim, G. J. Partfitt, C. S. De Pavia, S. C. Pflugfelder, T. N. Shah, E. O. Potma, D. J. Brown and J. V. Jester in *The Ocular Surface* 12: 59-68, 2014.

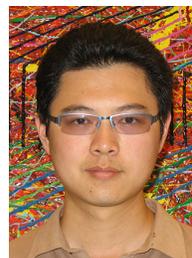
“Integrated IVUS-OCT imaging for atherosclerotic plaque characterization” by X. Li, J. Li, J. Jing, T. Ma, S. Liang, J. Zhang, D. Mohar, A. Raney, S. Mahon, M. Brenner, P. Patel, K. K. Shung, Q. Zhou and Z. Chen in *IEEE J. of Selected Topics in Quantum Electronics* 20: 7100108, 2014.

“Comparison of laser and diode sources for acceleration of in vitro wound healing by low-level light therapy” by R. Spitler and M. W. Berns in *Journal of Biomedical Optics* 19: 38001, 2014.

Arrivals and Departures

ARRIVALS

Youmin He, M.S., has joined the lab of Dr. Zhongping Chen as a Jr. Specialist where he will be developing software for optical coherence tomography (OCT).



Youmin He

Dong Hoon Lee, M.D., Ph.D., is a Visiting Researcher from BLI-Korea. He will be working on optical imaging with Dr. Bernard Choi for one year.



Dong Hoon Lee

Karan Sahni, B.S., has been hired as a Specialist to work in Dr. Petra Wilder-Smith's lab. He will be doing translational research on oral cancer detection.



Karan Sahni

DEPARTURES

Frances Lazarow, M.D., a postdoctoral fellow in Dr. Brian Wong's lab, has returned to the University of Illinois-Chicago, where she went to medical school, for her intern year. When she completes her internship, she has accepted a radiology residency at Eastern Virginia Medical School in Norfolk, VA, for the next four years.

Lonissa Nguyen Ponticorvo, Ph.D., who worked as a postdoctoral researcher in Dr. Bruce Tromberg's lab, has accepted a position with AMGEN in Thousand Oaks, CA.

Victor Sun, B.S., an Assistant Specialist who worked in Dr. J. Stuart Nelson's lab, has been accepted to dental school at the University of Pennsylvania in Philadelphia.

Marius Viseroi, M.D., who worked in Dr. Matthew Brenner's lab, has accepted a residency in internal medicine at Montefiore New Rochelle Hospital, NY.



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UROP and SURP *(cont'd from p. 7)*

Thai Nguyen, “Laser speckle contrast imaging using a consumer grade webcam” (SURP).

Mentor: Dr. Anthony Durkin

Rebecca Rowland, “Spatial frequency domain imaging of burn wound progression” (SURP).

Mentors: Drs. Anthony Durkin and Rolf Saager

An Dang, “A hand-held, quantitative imaging instrument for non-invasive, depth-resolved melanoma detection” (SURP).

Mentors: Drs. Enrico Gratton and Steve George

Amin Gosla, “Characterization of cell populations resulting from cardiac differentiation of human induced pluripotent stem cells” (SURP).

Mentor: Dr. Wangcun Jia

Maisie Cai, “Determining the safety

and efficacy for combined pulsed laser and topical delivery of rapamycin and axitinib to inhibit the regeneration of coagulated blood vessels” (SURP).

Mentors: Drs. Bruce Tromberg, Albert Cerussi, and Thomas O’Sullivan

Christopher Campbell, Kunal Dave, Elliot Kwan, Alex Matlock, Leanne Young, “Design of a low-cost, portable diffuse optical spectroscopic imaging system for *Helicobacter pylori* detection” (UROP and BME senior design project).

Mentor: Dr. Petra Wilder-Smith

Christoffer Caro, “Detection of demineralization and caries underneath fluoride varnish using OCT imaging” (UROP).

Gregory Chan, “Detection of caries underneath dental sealants using a low-cost, IR imaging modality” and “Phototargeting periodontal pathogen *P.*

gingivalis in submarginal conditions” (UROP).

Brian Jow, “Assessing dentition health beneath resin restorations with low-frequency IR imaging” and “Assessing effectiveness of a novel dentifrice in reducing overnight plaque reaccumulation” (UROP).

Daniel Kohanchi, “Livionex Inc. in vivo study to evaluate test dental gel in an in-situ erosion remineralization model” (UROP).

Erfan Nazeri, “Using optical coherence tomography technique to investigate the remineralization effect of the xylitol” (UROP).

Tiffany Chao, “Changes in enamel surface microstructure resulting from in situ erosion and remineralization using a novel toothpaste formulation” (SURP).