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WELCOME!

The Stanford Optical Society (a student chapter of OSA & SPIE) and the Stanford Photonics Research Center (SPRC) are delighted to welcome you all to SUPR 2015, our seventh annual conference and retreat! We are excited to build on our previous retreats with SUPR 2015 here in beautiful Monterey County.

SUPR began seven years ago with the premise that an off-campus conference to bring together Stanford's diverse and dispersed photonics community was long overdue. Since 2009, we have organized this retreat as a way to strengthen Stanford's photonics community, promote cross-disciplinary interaction, and engage with the wider research community beyond campus. Our agenda includes three days and two nights filled with seminars, poster sessions, workshops, and social activities. We believe that hosting this retreat off campus is essential to avoid daily distractions and to create an engaging yet relaxing atmosphere, conducive to fostering collaboration and innovation.

A special welcome goes to our many invited speakers and corporate partners. We greatly appreciate you sharing your valuable time and expertise with our community, and for your support of this retreat. Thank you for joining us!

We hope everyone enjoys this weekend and finds it a fun and intellectually stimulating experience!

Dear Stanford photonics community:

I am so glad to be back.

In 2012, after six years on the Farm, dozens of days (and nights) at the beamlines of LCLS and SSRL, hundreds of miles biked along Junipero Serra, and well over 1,000 mochas from the Starbucks by the secret Safeway, I completed my Ph.D. in chemistry at Stanford.

My work was made possible by forging collaborations between scientists of many disciplines, at levels ranging from grad student to lab director, from institutions across the country and around the world. Today, it is in that spirit that I return to the Cardinal community.

Please consider me your advocate within Thorlabs for your experimental needs. If there is anything you believe that Thorlabs can provide, from simple variants of existing products to entirely new product families, or if you have thoughts on how we can raise our standard of service, I would love to hear from you.

Thank you for welcoming me back for the third time.

Dan Daranciang, Ph.D. '12
daranciang@alumni.stanford.edu

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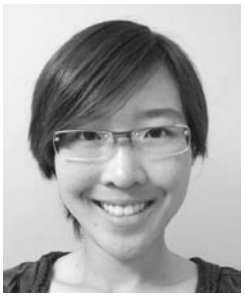

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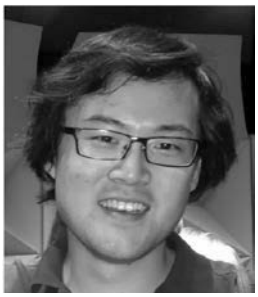

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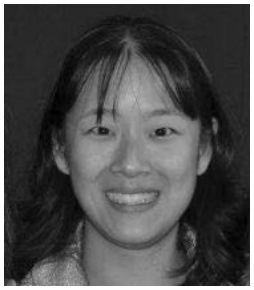

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Therice Morris
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STANFORD OPTICAL SOCIETY

The Stanford Optical Society is a joint student chapter of the Optical Society (OSA) and SPIE that has become one of the largest student chapters in the world. It is also one of the most active graduate student groups on campus. With a multi-disciplinary focus, we have organized a variety of activities to bring students together for technical education, science education outreach, and networking / social events.

We began as a small society, hosting technical seminars as well as luncheon discussions. Our seminar series has grown rapidly to include leaders such as Dr. David Welch (Co–Founder and Chief Marketing and Strategy Officer of Infinera), Dr. Timothy Day (Founder and CEO of Daylight solutions), Dr. Richard Swanson (CTO of SunPower), Dr. Jim Turner (former NIST Acting Director) and Prof. Bruce Tromberg (Director of the Beckman Laser Institute). In 2009 we organized the first Photonics Retreat. SUPR 2015 marks our seventh annual retreat.

In addition to our seminars and SUPR, our recent activities include high-impact science education outreach events and collaborative events with neighboring chapters and optics groups. These events include participation in the Stanford SPLASH program, Escondido Elementary School Science Night, Bay Area Maker Faire, Laser Harp presentations in local elementary schools, Bay Area Science Festival, and Stanford Summer Institute and Grant-Writing Workshop for High School Teachers.

More information about us and our upcoming events is available at: http://photons.stanford.edu

STANFORD PHOTONICS RESEARCH CENTER

The Stanford Photonics Research Center (SPRC) builds strategic partnerships between the Stanford University photonics community and corporations and organizations active in photonics or employing lasers and optical technologies in their research and product development activities. Member companies gain facilitated access to Stanford faculty, students and researchers by participating in SPRC events, supporting and collaborating on specific research projects, mentoring students and visiting research labs.

Member benefits also include priority alerting for Stanford photonics invention disclosures. SPRC promotes member company recruitment of Stanford students, and facilitates research interactions with Stanford Ph.D. students, faculty, and other researchers. In turn, Stanford students establish research connections with scientific experts and business leaders in the photonics industry that continue beyond their Stanford experience.

For more information, please visit: http://photonics.stanford.edu

FINANCIAL SUPPORT

The SUPR Planning Committee would like to thank the generous support of our many sponsors, and their commitment to the success of SUPR 2015. We are delighted to welcome eight corporate sponsors to SUPR this year and we are deeply grateful to all of the following organizations for their financial support.

SUPR 2015 Partners

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Western Digital

Additional Support

SPRC Stanford Photonics Research Center

OSA The Optical Society

SPIE.

Stanford Engineering Electrical Engineering

SLAC National Accelerator Laboratory

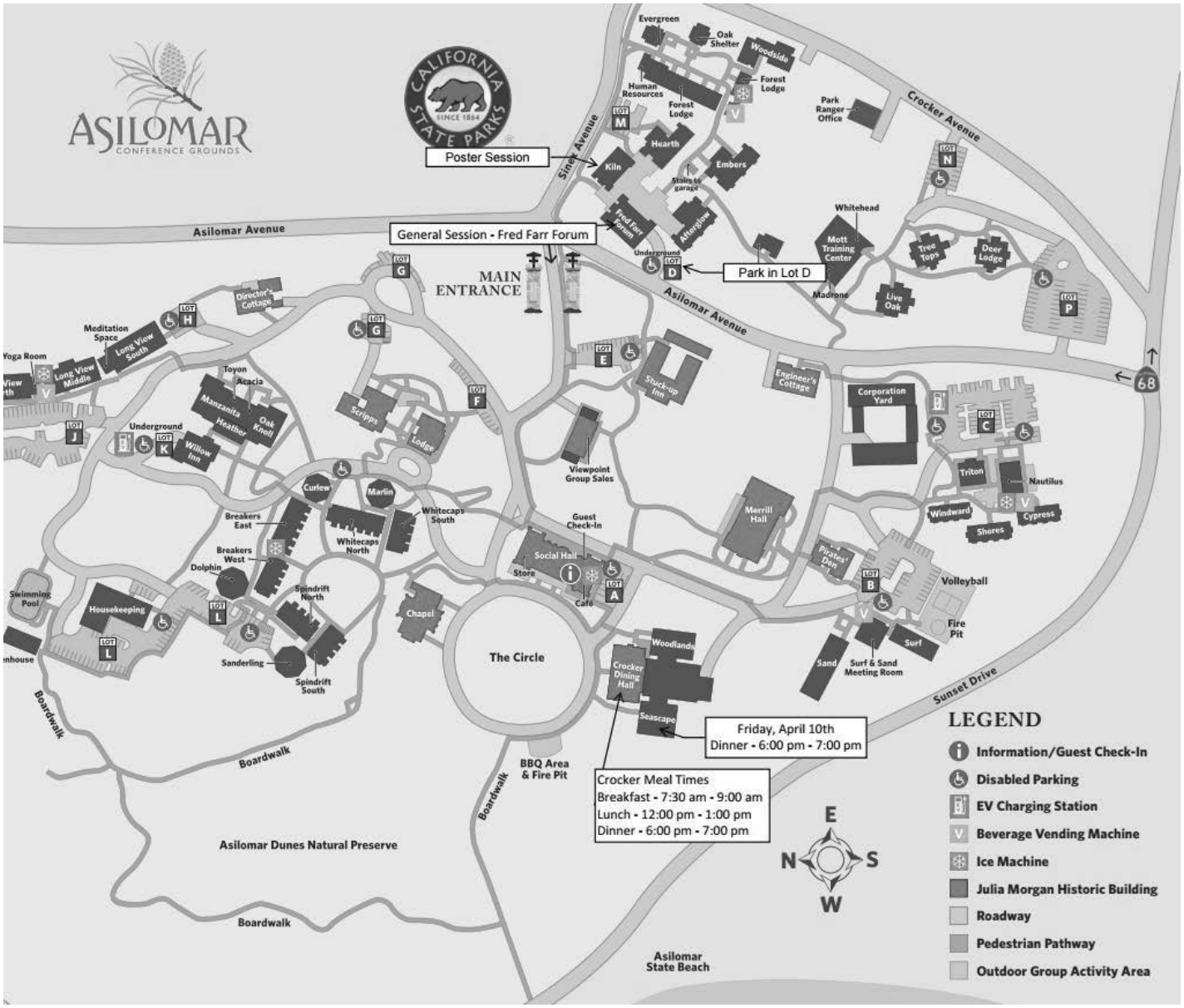
Vice Provost for Graduate Education

Stanford Applied Physics

Stanford Physics

Ginzton Laboratory

ASILOMAR MAP

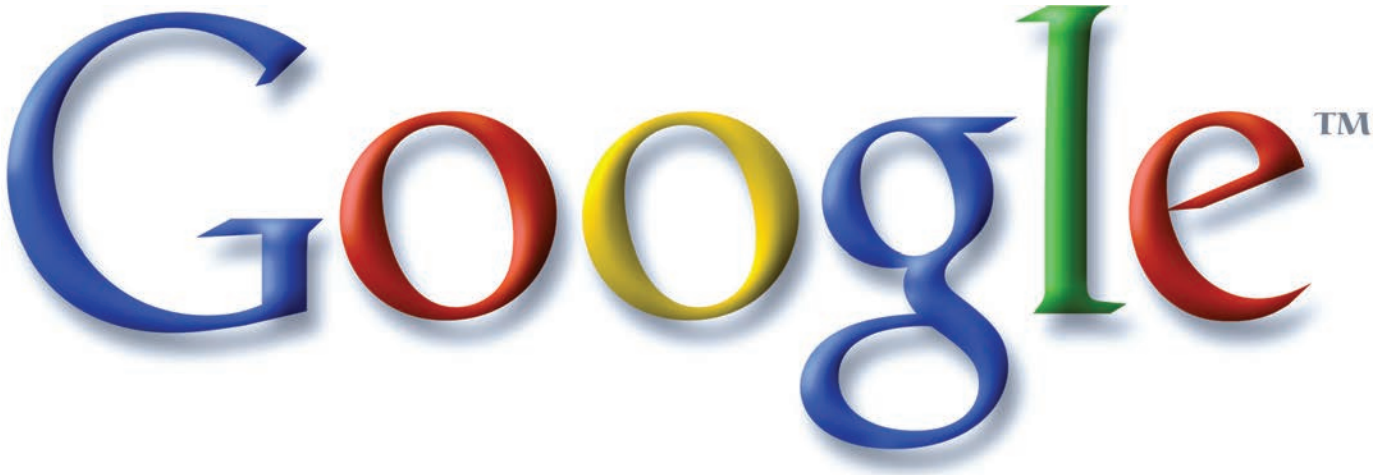


SCHEDULE

Friday, April 10, 2015		
4:00 – 5:00 pm	*Fred Farr*	Arrival & check in
5:00 – 6:00 pm	*Fred Farr*	Welcome reception / Poster setup
6:00 – 7:00 pm	*Seascape*	Dinner
7:00 – 7:10 pm	*Seascape*	Welcoming remarks
7:15 – 8:00 pm		Keynote address: Professor W.E. Moerner Title: The Story of Light and Single Molecules, from Early Spectroscopy in Solids, to Super-Resolution Nanoscopy in Cells and Beyond
8:00 – 9:15 pm	*Kiln*	Poster session I
9:15 – 10:30 pm	*Firepit*	Bonfire

Saturday, April 11, 2015		
8:00 – 9:00 am	*Crocker*	Breakfast
9:00 – 9:40 am	*Fred Farr*	Invited lecture: Professor Tony Heinz
9:45 – 10:25 am		Invited lecture: Professor Jonathan Fan
10:25 – 10:35 am		Coffee break
10:40 – 11:55 pm	*Fred Farr*	Teambuilding workshop
11:55 – 12:00 pm		Group picture (Remember to bring your SUPR t-shirt!)
12:00 – 1:00 pm	*Crocker*	Lunch
1:00 – 6:00 pm		Free time / Poster setup
6:00 – 7:00 pm	*Crocker*	Dinner
7:15 – 8:00 pm	*Fred Farr*	Invited lecture: Professor Karl Deisseroth
8:00 – 9:15 pm	*Kiln*	Poster session II
9:15 pm	*Fred Farr*	Trivia and Social activities

Sunday, April 12, 2015		
8:00 – 9:00 am	*Crocker*	Breakfast – Bring your luggage and room keys to Fred Farr
9:00 – 9:40 am	*Fred Farr*	Invited lecture: Professor Jelena Vuckovic
9:45 – 11:00 am		Workshop: Making Stress Manageable: Identifying and Managing Stress in Graduate School , Dr. Lindsay Ellch
11:00 – 11:15 am		Coffee break
11:20 – 12:00 pm	*Fred Farr*	Invited lecture: Professor Manu Prakash
12:00 – 12:10 pm		Closing remarks/Prizes
12:10 – 1:00 pm	*Crocker*	Lunch
1:00 pm		End of SUPR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KEYNOTE SPEAKER

W.E. Moerner

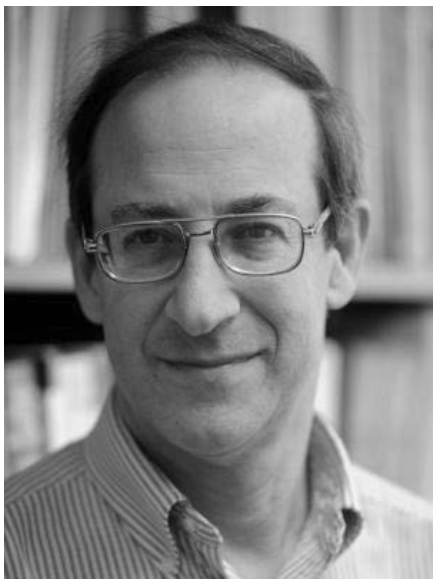
Harry S. Mosher Professor in Chemistry and Professor, by courtesy, of Applied Physics
Nobel Laureate in Chemistry 2014

W. E. (William Esco) Moerner, the Harry S. Mosher Professor of Chemistry and Professor, by courtesy, of Applied Physics at Stanford University, conducts research in physical chemistry and chemical physics of single molecules, single-molecule biophysics, super-resolution imaging and tracking in cells, and trapping of single molecules in solution. His interests span methods of precise quantitation of single-molecule properties, to strategies for three-dimensional imaging and tracking of single molecules, to applications of single-molecule measurements to understand biological processes in cells, to observations of the photodynamics of single photosynthetic proteins and enzymes. He has been elected Fellow/Member of the NAS, American Academy of Arts and Sciences, AAAS, ACS, APS, and OSA. Major awards include the Earle K. Plyler Prize for Molecular Spectroscopy, the Irving Langmuir Prize in Chemical Physics, the Pittsburgh Spectroscopy Award, the Peter Debye Award in Physical Chemistry, the Wolf Prize in Chemistry, and the 2014 Nobel Prize in Chemistry.

FACULTY SPEAKERS

Tony Heinz

Professor of Applied Physics and Photon Science



Tony Heinz is a Professor of Applied Physics and Photon Science at Stanford University and the Director of the Chemical Sciences Division at the SLAC National Accelerator Laboratory. Heinz received a BS degree in Physics from Stanford University and a PhD degree, also in Physics, from the University of California at Berkeley in 1982. Heinz was subsequently at the IBM Research Division in Yorktown Heights, NY until he joined Columbia University in 1995 as a Professor of Electrical Engineering and Physics. At Columbia, he served as the Chair of the Department of Electrical Engineering from 2003 until 2007. He has also served as a Scientific Director of the Columbia Nanoscale Science and Engineering Center (NSEC) and of the Energy Frontier Research Center (EFRC). He was the President of the Optical Society of America in 2012. Heinz joined Stanford University in 2015.

Heinz's research has centered on the elucidation of the properties and dynamics of nanoscale materials through the application of a wide range of optical spectroscopies. His research on surfaces, interfaces, and nanoscale materials, such as carbon nanotubes, graphene and other 2D materials, has been recognized by Optics Prize of the International Commission for Optics, a Research Award of the von Humboldt Foundation, the Julius Springer Prize for Applied Physics, and the Isakson Prize of the American Physical Society.

Jonathan Fan

Assistant Professor of Electrical Engineering

Jonathan received his BSE degree in Electrical Engineering from Princeton University in 2004 with highest honors and his PhD in Applied Physics from Harvard University in 2010 under the supervision of Professor Federico Capasso. He was an NSF Graduate Fellow, and his dissertation focused on the optical properties of self-assembled metallodielectric colloidal clusters. Afterwards, he was a Beckman Institute Postdoctoral Fellow at the University of Illinois in Urbana-Champaign, where he researched epidermal-based stretchable electronics systems under the supervision of Professor John Rogers. His current research as an Assistant Professor of Electrical Engineering at Stanford University includes the exploration of novel types of plasmonic systems and their applications as well as flexible and stretchable optical and electronic devices. He has recently been awarded an Air Force Young Investigator Award.

Karl Deisseroth

Professor of Bioengineering and of Psychiatry and Behavioral Sciences

Karl Deisseroth did his undergraduate studies at Harvard, after which he attained both an MD and a PhD in Neuroscience at Stanford. Although he originally intended to become a neurosurgeon, his experience during a psychiatric rotation made him want to understand the neural mechanisms underpinning psychiatric disorders. At the time of his studies, however, all existing techniques for probing neural activity were either too slow or too low-resolution to achieve these aims. In 2004, Deisseroth founded his own lab at Stanford as an Assistant Professor of Bioengineering and Psychiatry and shortly thereafter developed "optogenetics", a method to induce light-sensitivity in neurons by inserting protein-coding DNA from

algae. Optogenetics has revolutionized the field of neuroscience with thousands of researchers around the world adopting the techniques. A second groundbreaking technique developed by Deisseroth and his team, CLARITY, makes brain tissue transparent to light while preserving its structural integrity, enabling new revolutionary brain-imaging techniques. Since 2012 Karl Deisseroth has been the D.H. Chen Professor of Bioengineering and of Psychiatry and Behavioral Sciences. He has won many awards, including a Presidential Early Career Award in Science and Engineering, a McKnight Foundation Scholar Award and the Lurie Prize in Biomedical Sciences. He is a member of the National Academy of Sciences.

Jelena Vuckovic

Professor of Electrical Engineering

Jelena Vuckovic is a Professor of Electrical Engineering and by courtesy of Applied Physics at Stanford, where she leads the Nanoscale and Quantum Photonics Lab. She is also a faculty member of the Ginzton Lab, Bio-X and the Pulse Institute at Stanford. Upon receiving her PhD degree in Electrical Engineering from the California Institute of Technology (Caltech) in 2002, she worked as a postdoctoral scholar at Stanford. In 2003, she joined the Stanford Electrical Engineering Faculty. As a Humboldt Prize recipient, she has also held a visiting position at the Institute for Physics of the Humboldt University in Berlin, Germany (since 2011). In 2013, she was appointed as a Hans Fischer Senior Fellow at the Institute for Advanced Studies of the Technical University in Munich, Germany.

Professor Vuckovic has received many awards including the Marko V. Jaric award for outstanding achievements in physics (2012), the DARPA Young Faculty Award (2008), the Chambers Faculty Scholarship at Stanford (2008), the Presidential Early Career Award for Scientists and Engineers, the Office of Naval Research Young Investigator Award (2006), the Okawa Foundation Research Grant (2006), and the Frederic E. Terman Fellowship at Stanford (2003). She is on the editorial advisory board of Nature Quantum Information and ACS Photonics, and was on the editorial board of the New Journal of Physics.

Manu Prakash

Assistant Professor of Bioengineering

Manu Prakash earned a Bachelor of Technology in computer science and engineering from the Indian Institute of Technology, Kanpur before moving to the United States. He did his master's and PhD studies in Applied Physics at MIT before coming to Stanford as an Assistant Professor of Bioengineering in 2011. His research brings together experimental and theoretical techniques from soft-condensed matter physics, fluid dynamics, computational theory, and unconventional micro- and nano-fabrication to open problems in biology, from the organismal to the cellular and the molecular scale. His group designs and builds precision instrumentation including droplet microfluidic tools to probe and perturb biological machines and their synthetic analogues. They also apply their expertise to inventing novel technologies for the global health context with clinical applications in extremely resource-poor settings. Their ultra-low-cost, "print-and-fold" paper microscope won a $100,000 grant from the Gates Foundation in 2012.

WORKSHOP SPEAKER

Lindsay Ellch

Staff Psychologist at CAPS

Dr. Lindsay Ellch is a Staff Psychologist at Stanford University's Counseling and Psychological Services (CAPS). In addition to providing clinical services to the Stanford community, she also serves on the Mental Health Promotion and Risk Reduction Team, which provides a number of outreach, prevention, and education programs on campus. As a post-doctoral fellow at Stanford she assisted with the development, organization, training, and facilitation of Stanford's new community-based stress reduction program, "StressLess@Stanford", which is now being implemented at campuses throughout the country. Prior to working at Stanford, she also trained at Emory and Northwestern University. Dr. Ellch's research and clinical interests include stress and anxiety management, mindfulness, and wellness.

Welcome to HP Labs

HP Labs is HP's central research organization. We look at emerging trends to understand where our industry – and our world – is headed and invest in a forward-looking, ambitious research agenda. We create revolutionary technologies to address the most complex questions and important opportunities facing our customers and society in the next decade and beyond.

We are passionate about making our research real – creating solutions that transform data into value, bytes into experiences, and noise into knowledge. We're building a pipeline to fuel the next generation of HP products and services, delivering breakthroughs that can disrupt current industries and create new ones. We generate real value by identifying the most strategic routes to commercializing our innovations, taking our technologies from prototype to near market-ready, and working with our partners to deliver new capabilities and solutions.

HP Labs' global footprint expands our access to ideas, talent and partners and informs our research through the local environments in which we work. Our diverse perspectives and disciplines come together to solve our customers' most pressing challenges, putting innovation into the hands of billions around the world.

The **Large-Scale Integrated Photonics** (LSIP) group, part of the Systems Research Lab, is a world-renowned HPL research team producing outstanding research in nanophotonics and quantum optics, with recent publications in Nature, Nature Photonics, Physical Review Letters, Optics Letters, and Optics Express.

Our program is well-funded internally and has an impressive record of attracting significant government funding. Our team members have enjoyed exceptional success in launching scientific and engineering careers in both industrial and academic settings. In addition, our post-doctoral research associate positions offer competitive salaries and benefits for qualified candidates.

Positions are available: hpl.hp.com/jobs

Working today to solve tomorrow's problems

"Big Data" is getting even bigger, at a faster pace than ever anticipated. We expect a 50x increase in the amount of data produced annually from 2009 to 2020[2]. With an increasing number of new devices online, the growth of the "Internet of Things," sensing, mobile devices and smart cities, the data explosion is outpacing technology. The more we connect our digital and physical worlds, the more data we produce. Today's computing architectures will eventually be unable to keep up with this explosion of data. A quantum leap in performance will be required to manipulate these exabyte-scale data sets. Similar gains in energy efficiency are vital to make powering the data centers of the future sustainable and affordable.

HP Labs aims to deliver technologies that will turn this massive amount of data into a real competitive advantage, delivering business insight at real-life speeds, where business questions arise automatically from data, and personalized content allows your data to follow you across different devices.

To reach our goals, HP Labs invests in five interconnecting research areas:

Analytics positions HP to help our customers take advantage of the data explosion – integrating data sources, transforming and automating business processes, and acting on relevant insights – at unprecedented scale. Our research seeks to develop analytics systems, technologies and infrastructure as well as applications and visualizations that make these platforms easy to use.

Networking and Mobility conducts fundamental research in network architecture, communications and mobility. We are creating solutions for predictable, high-quality and power-efficient networks capable of dealing with the vastly increasing amounts of data that are outpacing today's technology. Key focus areas include software defined networking (SDN), seamless mobility solutions, and mobile device and persona management.

Printing and Content delivers strategic core innovations in document and content solutions, generating customer value through the next wave of personalized content experiences and data visualization services. We also deliver breakthrough innovations for the next generation of print engines and high-performance materials, data-driven, automated print production management, and accurate automated color control for a wide range of commercial printing applications.

Security and Cloud addresses the challenges faced by the increasing movement of IT to the cloud. As our world becomes more connected, with growing amounts of data moving online and across public, private and hybrid clouds, management of this data is set to become even more complex. We're creating new ways to handle the movement of information across corporate, national and legal boundaries at enormous scale and speed while providing assurance, insight and control. We're also developing technologies ranging from embedded security control points within devices to novel mechanisms for the detection and mitigation of modern attacks at massive scale, providing a robust chain of trust from bottom to top.

Systems research develops radical new approaches to collect, process, store and analyze data to create the next generation of large-scale, high-performance infrastructure to support the data-centric world. These new software-defined systems will fuse memory and storage, flatten complex data hierarchies, bring processing closer to the data, and enable security of systems at the point of attack. We're also shaping the future of cognitive computing, making processing available on a massive scale, to enable personalized cognitive assistants to help improve human decision-making.

HP Moonshot System: built for extreme low-energy

With nearly 10 billion devices connected to the internet and predictions for exponential growth, we have reached a point where the space, power, and cost demands of traditional technology are no longer sustainable. HP Moonshot, the world's first software-defined web server, builds on 10 years of extensive low-energy computing research from HP Labs, and delivers breakthrough efficiency and scale.

HP Moonshot web servers are designed and tailored for specific workloads to deliver optimum performance. These tiny, low-power servers share management, power, cooling, networking and storage across thousands of servers by pooling resources, and each node is optimized for whatever application it is running. They will bring unprecedented energy and cost savings to tomorrow's large-scale, data-intensive applications – using 89% less energy, 80% less space at 77% less cost than traditional systems [3].

For example, HP Moonshot servers are now being used to run HP.com, which serves over 11 million people every month, and now runs using the same amount of power it takes to run 12 60-watt light bulbs.

HP Moonshot marks the beginning of a new style of IT that will change the economics of computing infrastructure and lay the foundation for the world's next 30 billion connected devices.

[2] **Source** IDC Digital Universe Report, 2012
[3] **Source** According to internal HP engineering that compares HP Moonshot servers with traditional x86 server technology.

FRIDAY POSTER SESSION

Student	Poster Title
Arushi Arora	Slow Light Strain Sensor
Adam S. Backer	Determining the Rotational Mobility of a Single Molecule from a Single Image: A Numerical Study
Camille A. Bayas	Three-dimensional super-resolution imaging of the RNA degradation machinery in Caulobacter crescentus
Nate Bogdanowicz	Coherent Feedback in Cavity QED Systems
Kaifeng Chen	Heat-flux control and solid-state cooling by regulating chemical potential of photons in near-field electromagnetic heat transfer
Alberto G. Curto	Towards a splitter for valley optoelectronics
Julien Devin	Modulation of High Harmonic Generation in SO_2 Due to Molecular Vibration
Sage Doshay	Mechanically Tunable Optical Response of Large-Area Stretchable Plasmonic Arrays
Stephen Hamann	Holographic Direct View Display From Light Field Recording
Ryan Hamerly	Switching and Oscillation in Photonic Ising Machines
Tiffany W Huang	Nano-optical conveyor belt
Maurice Lee	Corkscrew point spread function for 3D super-resolution microscopy
Ken Leedle	Dielectric Laser Accelerators
Orly Liba	High Resolution Cancer Imaging With Spectral Domain Optical Coherence Tomography
Angelica Parente	A hybrid approach to map the N-gate conformations of DNA gyrase in multiple functional states
Christopher Rogers	Thin Film Optical non-linearities for Computing
Armand Rundquist	On-chip generation of nonclassical light via detuned photon blockade
Hardeep Sanghera	Coherent Feedback in Cavity QED Systems

SATURDAY POSTER SESSION

Student	Poster Title
Christy Amwake	Cultivation of large populations of homogeneous differentiated stem cells for regenerative medicine applications
Andrew Ceballos	Silicon Technology for Dielectric Laser Accelerators
Alex Diezmann	Multicolor 3D super-resolution images of bacterial proteins reveal nanoscale spatial organization
Catherine Jan	Acoustic Detection of Stem Cell-Derived Cardiomyocytes
Thomas Juffmann	Quantum enhanced electron microscopy
Sandy Kjono	A modal approach to digitally remove GRIN lens aberrations
Jessica Piper	Broadband absorption enhancement in monolayer MoS2
Marina Radulaski	Silicon Carbide Photonics
Nikolas Tezak	A coherent Perceptron for all-optical Learning
Ken Wang	Phenomenological Theory of Resonant Antireflection
Song Wang	Aligning Asymmetric Top Molecules with THz Pulses
Lucien E Weiss	Single-Molecule Tracking of Labled Proteins in Primary Cilia
Stephen Wolf	Power Scaling of 2-um Systems
Ken Wong	Photonic crystal mirrors with strong gradients of reflected phase
Joshua Yoon	3D Tracking of Single Molecules in the Primary Cilium
Leo Yu	Practical communication of quantum-dot spins via time-bin-encoded photons at telecom wavelengths

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SATURDAY AFTERNOON ACTIVITIES INFORMATION

Main Excursion - Point Lobos

Point Lobos State Natural Reserve is known for its beautiful coastal walks, vistas, and wildlife. A relaxing stroll down Sea Lion Point Trail offers views of basking sea lions while Cypress Grove winds through coastal shrubbery and shows off waves crashing into the rocky California coast. If you're lucky, you might even get to see some gray whales as they migrate by in the early spring. The trails vary in length, from half a mile to 4-5 miles. The park fee ($10/vehicle) will be paid by SUPR.

Finish up lunch and start driving around 12:30-1. It takes about 25 minutes to get to Point Lobos from the Asilomar Conference Grounds. We will start with the Cypress Grove Trail, a short (0.8 mile) scenic tour through the cypress trees and rocky coastal outcrops. Next, we can check out Sea Lion Point Trail (0.8 miles), where you should be able to see (and hear) dozens of sea lions basking in the sun.

For the adventurous, there are many more trails that you can experience during the allotted time, available at http://www.pointlobos.org/

Bring layers (if it's windy it can be chilly), sunscreen, good trail walking shoes, and your camera! Make it back to Asilomar by 5:30pm, because dinner starts at 6:00pm.

Main Excursion - Monterey Bay Aquarium

Less than a ten-minute drive away from the Asilomar Conference grounds is the famous Monterey Bay Aquarium, known as one of the best aquariums in the US. Giant pacific octopi, African Blackfooted penguins, southern sea otters, and green sea turtles await! The cost for student tickets is $34.95, which will not be covered by SUPR.

Finish up lunch and make the short drive to the Monterey Bay Aquarium. You will have plenty of time to spend the afternoon exploring the aquarium. Make sure to check out the daily shows that day to get the most out of your visit!

Bring comfortable walking shoes and your camera! Make it back to Asilomar by 5:30pm, because dinner starts at 6:00pm.

Other Activities

Wine Tastings

There are dozens of wineries scattered throughout the Monterey Bay area. Wine tastings start as little as $5-10, and some are free with the purchase of a bottle of wine.

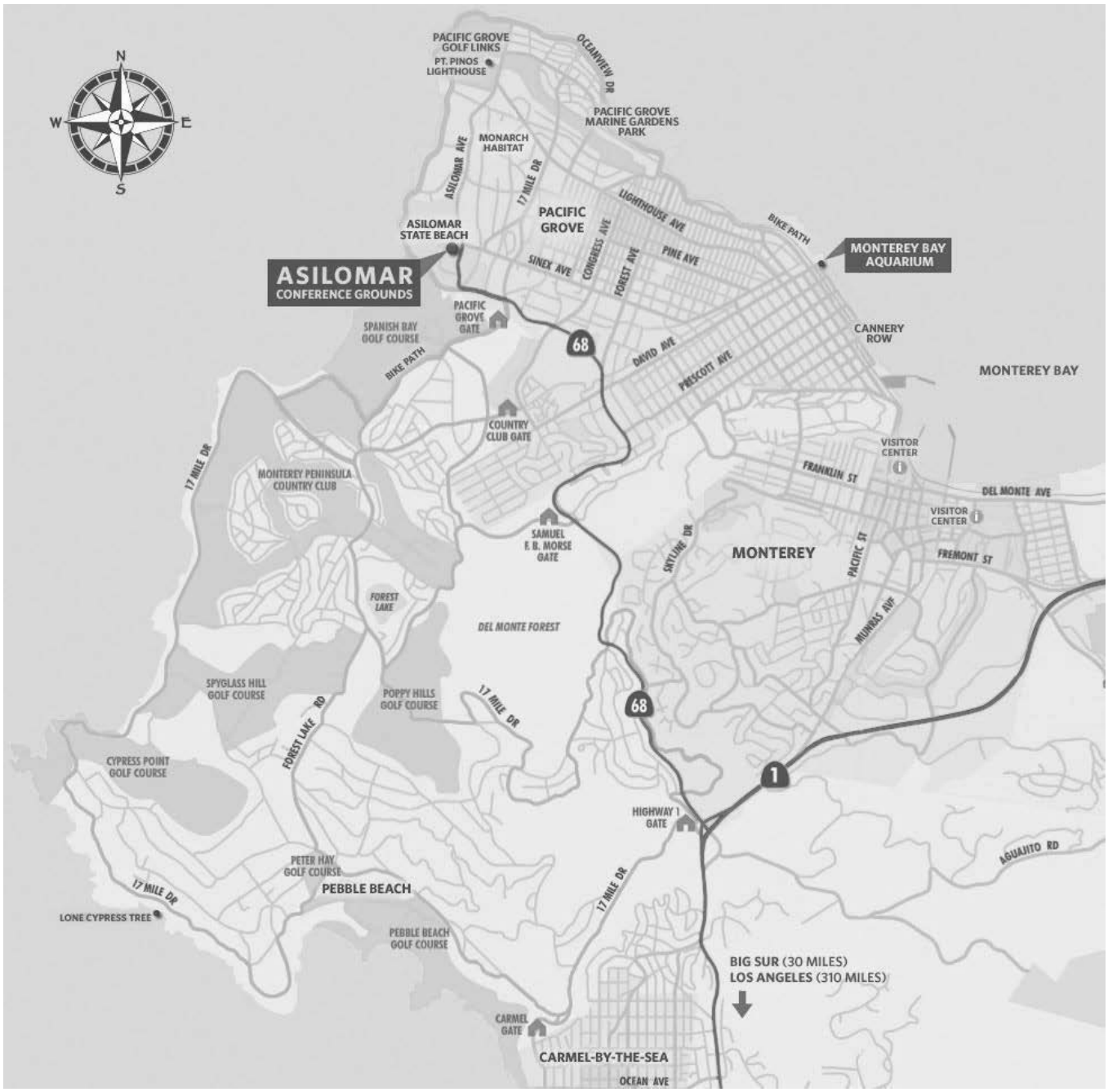
Carmel Beach (Located 6.7 miles from Asilomar)

Carmel beach is a beautiful stretch of white sand, perfect for sunbathing and walking. Find parking around the end of Ocean Ave and spend the rest of the afternoon relaxing! If you begin to feel a bit restless, there are several parks and shops nearby. For the adventurous, bikes are available for rent at Asilomar to bike to Carmel.

Shopping in Carmel (Located along Ocean Ave, Carmel, 6 miles from Asilomar)

For those that want to meander around the Carmel shops, this is where to do it. Shop for souvenirs, wine / cheese / chocolates, clothing, or just take in the sights of the quaint town of Carmel. For the adventurous, bikes are available for rent at Asilomar to bike to Carmel.

MONTEREY BAY AREA MAP



Sandia's Photonics Capabilities

Sandia National Laboratories

Sandia is positioned to engage in partnerships in silicon and compound semiconductor photonic device or system research, development and prototyping. Sandia's broad technology base combined with vertical integration from crystal growth to prototype development enables leveraging of design and fabrication expertise mated to technology/ capability gaps. Interactions leveraging Sandia's technical expertise in a collaborative fashion make best use of the capability and enhance success.

The multi-mission environment of the Labs promotes a diverse, multi-disciplinary team of subject matter experts in fabrication labs and clean room facilities. Two important Sandia support labs - the Silicon Photonic Foundry and the III-V Photonic Integrated Circuit (PIC) Lab - are co-located inside the MESA facility.

Areas of Expertise

Compound III-V Photonics

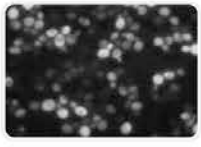
The InGaAsP/InP PIC program at Sandia National Labs resides within the MESA facility and is presently used for customer-specific photonic R&D, such as optical data sampling and RF-analog signal processing in the optical domain. Demonstrated capability exists to 40 Gb/s.

Silicon Photonics

The silicon photonics process is an electro-optical silicon photonic integrated circuit platform built on silicon on insulator (SOI) wafer technology with fully integrated Ge detectors.

Heterogeneous Integration

Sandia has unique capabilities in hybrid integration of custom photonic devices and advanced electronic circuits, enabling prototyping of high-performance optoelectronic systems and microsensors.

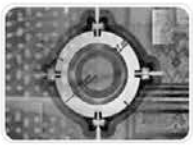


Biological Microsensors

Sandia's Microsystems effort develops sensors and sensor arrays for biological detection.

Advanced Packaging

Sandia experts have decades of experience with the microsystems packaging process, a key step in successful development of integrated systems.



Applications

Sandia's mission in national security has fostered capabilities and technologies including Photonics, Photovoltaics, Focal Plane Arrays, Advanced Sensors, Optical MEMS, Plasmonics, and Metamaterials.

Failure Analysis, Test, and Reliability Support

Sandia experts invent, develop and utilize different tools and techniques for root cause failure analysis. Sandia supports its customers throughout the product life cycle.

For more information about Sandia please visit the following:

Photonics Capabilities and Contributions to the Integrated Photonics Institute for Manufacturing:
http://wwwd.sandia.gov/mstc/IPIMI/

Career Opportunities: http://www.sandia.gov/careers/

The Center for Integrated Nanotechnologies:
http://cint.lanl.gov/

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