Optical Society of Southern California

IMAGES

Newsletter Volume 25, Number 4 WWW.OSSC.ORG January 2019

From the President

Greetings OSSC Members! Our program year is into full swing, and we have several more exciting events scheduled. However, we have had to make some changes in our schedule. We are postponing our JWST talk from February to later in the year because the OTI (gold primary mirrors) will be covered and the SCE is in environmental testing until March. We will have another great topic and speaker from OEWaves CTO Andrey Matsko on their WGM micro-resonator technology. Part of OEWaves was spun off to Strobe to use in autonomous vehicles, and GM acquired them. So, the technology from OEWaves is being used by a wide variety of industries now.

The topic and presentation by Simon Prince from Illumina was very informative on the technology, market and optics. Although we had talks on super-resolution imaging and other bio-photonics applications, I am glad that we have a couple of bio-optics related talks this year. I never thought about the difficulty of achieving photolithographic resolution in the visible. A few of us were very excited about the quick payback on purchasing the Illumina equipment, but I doubt the plans we spawned that night will come to fruition.

One other aspect of the talk that I found interesting was the discussion of the non-optical technologies that could overtake those at Illumina. This reminded me of some past experiences, where I came up with better solutions of a problem that were non-optical. I was also reminded how sometimes I have been told that I was venturing outside how someone else narrowly defined my “optics” role. This in turn reminded me of my first optics class at the University of Rochester, Optics 100, by Kazimierz Rzążewski, who was a visiting professor. We covered some pretty advanced material topics for freshmen. Our joke was that the prerequisites for Optics 100 were Ph.D.s, in Greek, Latin, Mathematics, Physics, and total mastery of all other subjects. Now, this same material would have relatively easy if taken as a senior. Most of us in optics including the lens design experts spend a lot of time solving difficult multi-disciplinary problems that enable or allow the optics to work and be the enabling technology that it is despite many who wrongly consider it a niche or believe that an optical professional cannot apply their tools in another application. I personally learned that I needed to constantly learn how others apply these tools of math and physics in Optics 100. Similarly, the rest of you learned the same thing along the way, which is why unlike many other engineers and scientists you join us each month to share in our discussions, presentations, networking and other activities to solve old and new problems. Now, hopefully this rambling was more motivating than sleep inducing, and one or more individual is motivated to assist the society in achieving our common goal by filling one of the open chair positions or even sharing something new or old with us at the next meeting. Let’s make 2019 another great year.

Sincerely,

Nicholas J. Croglio Jr.
OSSC President 2018/19

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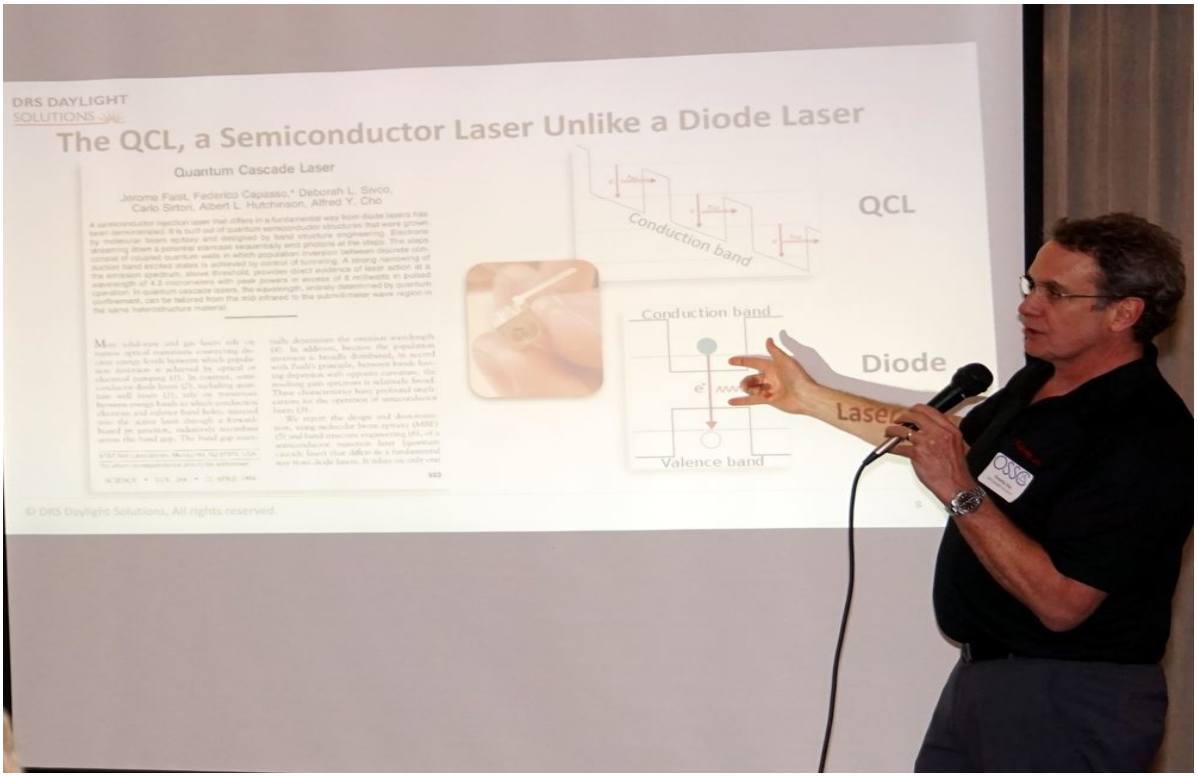
From the Editor

Welcome to the January 2019 Images Newsletter!

Several volunteer positions remain open for those who wish to contribute to OSSC while developing their leadership skills and getting to know the local optics community better. Please reach out to any of the BOD members to find out more about the open positions and responsibilities entailed. And if one of the filled positions interests you, the current person holding the role will likely be glad to have the help.

As a reminder, photographs and albums of OSSC events can be viewed at OSSC Photo Album List. Photographs from the recent monthly meetings and Mirror Tech Days can be found at this weblink. If you have recent event photos or photos from years past, please send to any BOD member or OSSC leader for posting on the website.

President Nicholas Croglio presenting OSSC December 2018 guest speaker Dr. Simon Prince his one year OSSC Membership Certificate.

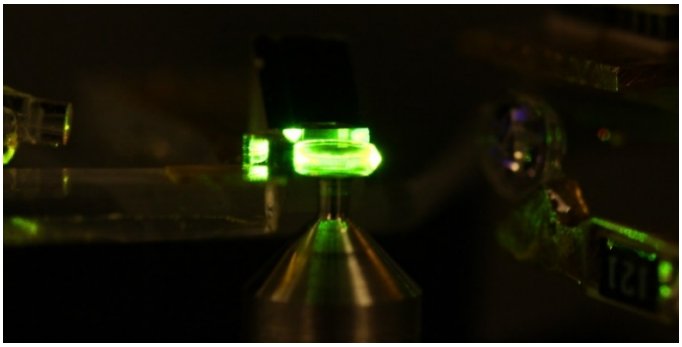


The January 2019 meeting at the Joint Forces Training Base, Los Alamitos.

Advancing Microresonator-Based Photonics Technology at OEWaves

Dr. Andrey Matsko, CTO, OEWaves
OSSC Monthly Meeting
Wednesday, February 13th, 2019

Abstract: Crystalline whispering gallery mode resonators (WGMRs) are characterized with kHz optical bandwidths achievable at room temperature. Such a narrow bandwidth enables their applications for generation of high spectral purity signals in both optical and radio frequency spectral domains. For instance, WGMR-based self-injection-locked semiconductor lasers can be created in visible and IR and have characteristics better than any other laser of similar size. As the result, miniature gyroscopes and clocks become feasible. WGMR-based X-Ka-band microwave photonic oscillators are characterized with spectral purity unachievable in both optical and electronic devices of similar form factor. Kerr frequency combs generated in WGMRs pumped with continuous wave light result in generation of femtosecond optical pulses on a chip. The frequency comb integrated with a miniature agile laser can be utilized for optical frequency synthesis. These and other applications will be discussed and analyzed in the presentation.



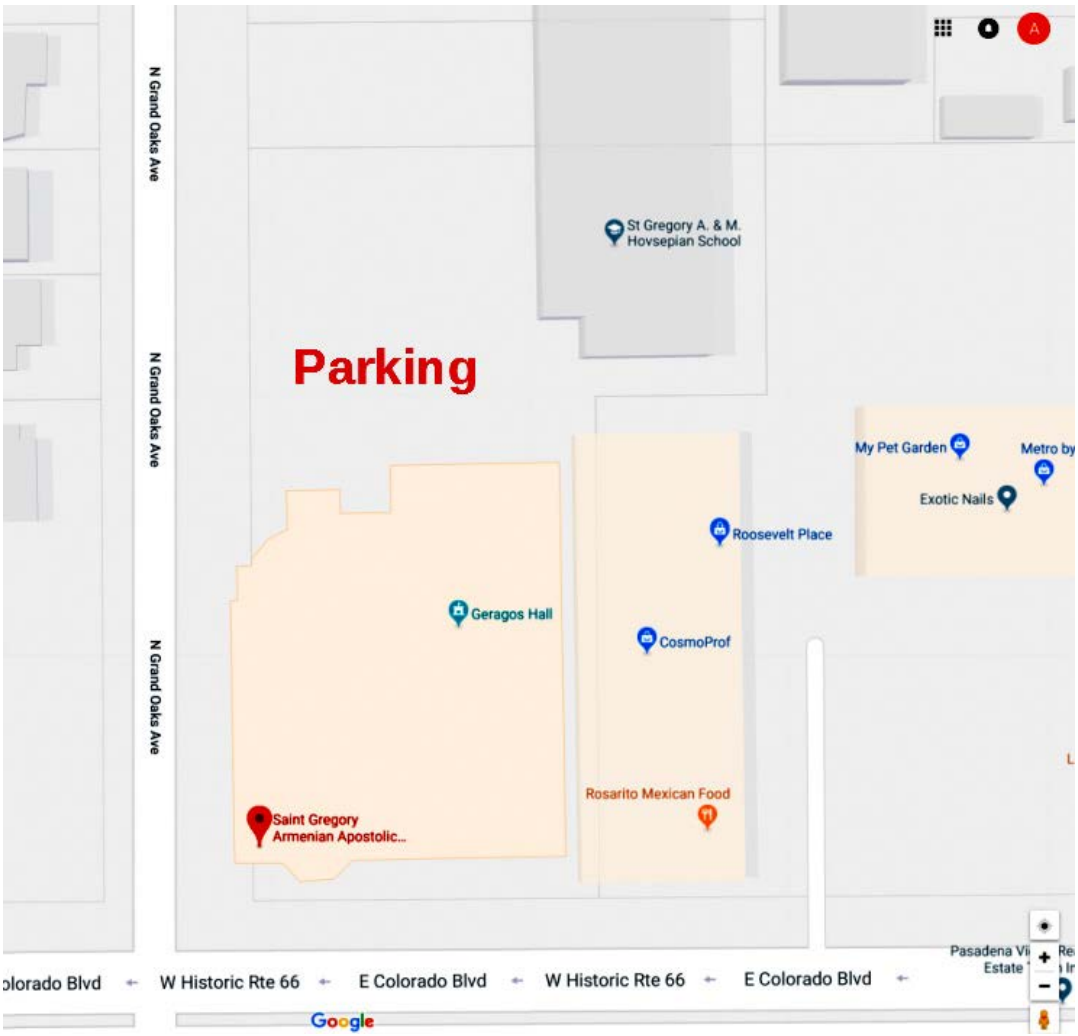
About our speaker: Dr. Andrey B. Matsko is the Chief Technology Officer of OEwaves Inc. Dr. Matsko has actively worked in the fields of laser physics, quantum and nonlinear optics, photonics, and quantum measurement theory since 1997. He contributed to the development of technology involving crystalline whispering gallery mode resonators, including electro-optical modulators, RF photonic receivers, optical and RF photonic filters, delay lines, clocks, magnetometers, gyroscopes, oscillators, and lasers. Dr. Matsko has authored and coauthored more than 180 peer-reviewed papers as well as forty US Patents. He is a Fellow of OSA as well as Senior Member of IEEE and SPIE having h-index of 58. He received multiple awards, most notably from Jet Propulsion Laboratory the 2005 JPLs Lew Allen Award for Excellence "For seminal and unique theoretical contributions in quantum optics, in particular, the nonlinear interactions of optical crystalline whispering gallery mode resonators, leading to the establishment of this new area of research at JPL". Dr. Matsko is also the recipient of the 2007 NASA Space Act Award in recognition of contributions to the National Space Program and the mission of the Jet Propulsion Laboratory.

Wednesday, February 13th, 2019
OSSC Monthly Meeting

Reception: 6:00 pm; Dinner: 7:00 pm
Talk: 8:00 pm
Meal: Buffet Style
Dinners: $30 members/$35 non-members registered by Feb. 8
$35 members/$40 non-members after Feb. 8
(OSSC Student Members $10 by Feb. 8, $20 after)

Venue:
St. Gregory Church
2215 East Colorado Boulevard
Pasadena, CA, 91107
On-line Registration: www.ossc.org or
Contact: Alex Small
Events@ossc.org, 240-672-7639

Parking for St. Gregory Church in Pasadena



St. Gregory Armenian Orthodox Church, 2215 E. Colorado Blvd., Pasadena, CA

The Vatican Advanced Technology Telescope (VATT)

by T. Scott Rowe

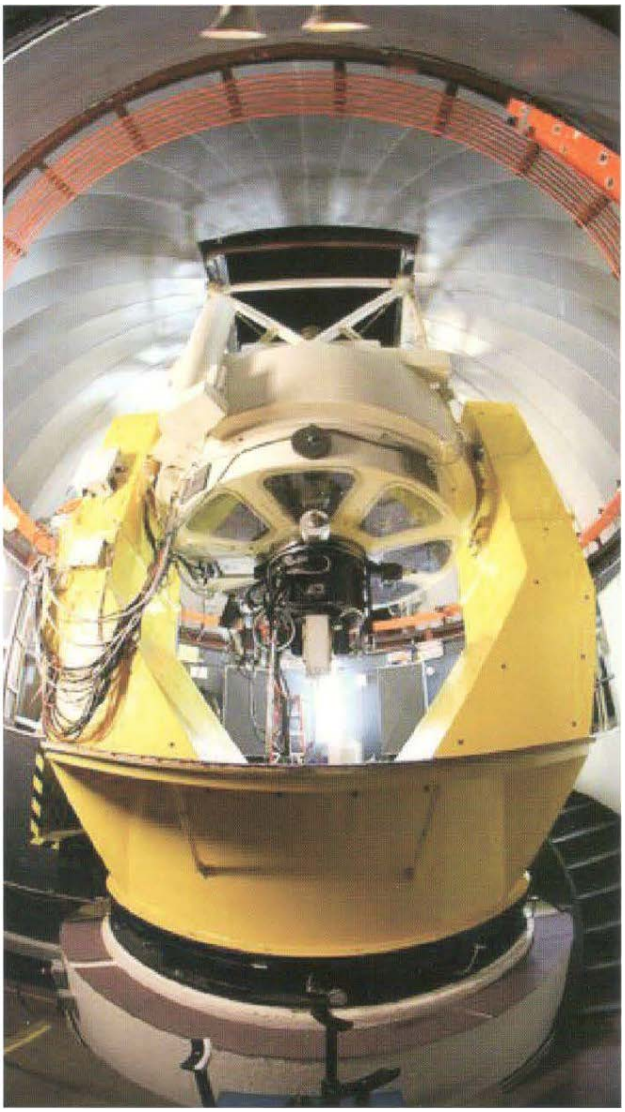
Back in September 2018, thanks to a notice on the OSSC website published by Bob Cartland, a number of OSSC members were able to attend a lecture by Vatican Astronomer Brother Guy Consomagno discussing the activities of the Vatican Observatory (VO) and in particular the Vatican Advanced Technology Telescope (VATT). While the talk on the history of the Vatican Observatory was interesting, and in particular, the Vatican's and the Roman Catholic Church's change of view on astronomy and astronomers from the time of Galileo to the present, what I found most intriguing (since I had heard nothing about it before) was the story on the development of the VATT. I thought that I might dig into this a little deeper, and report on what I found. Credit is given to Fr. Justin Whittington of the Vatican Observatory Foundation for helpful discussions, (The VOF is in Tucson, AZ), and the published VATT brochure he provided, from which I have appropriated liberally.

The VATT is situated on Mt. Graham, AZ, next to the Large Binocular Telescope. It was commissioned in 1993. Of particular uniqueness, it is fitted with a 2-meter, F/1 primary mirror, spin cast with the appropriate asphericity. This was done in Roger Angel's mirror shop at the University of Arizona, and was one of the first large, successful, spin cast mirrors from that shop. With such a fast primary, the telescope could be built with a relatively small secondary mirror in an aplanatic Gregorian design (see layout below). The VATT has served as a testbed for several other ideas for modern telescope design. The mirror is kept cooled to within a fraction of a degree of the ambient air temperature to eliminate thermal currents that cause blur. The aiming and focusing of the telescope is able to find objects to approximately 15 arc seconds (rms average), and its gear-free direct drive motors allow the telescope to find and track objects with less than an arc second of error. All these advances have since been applied to the new generation of giant telescopes.

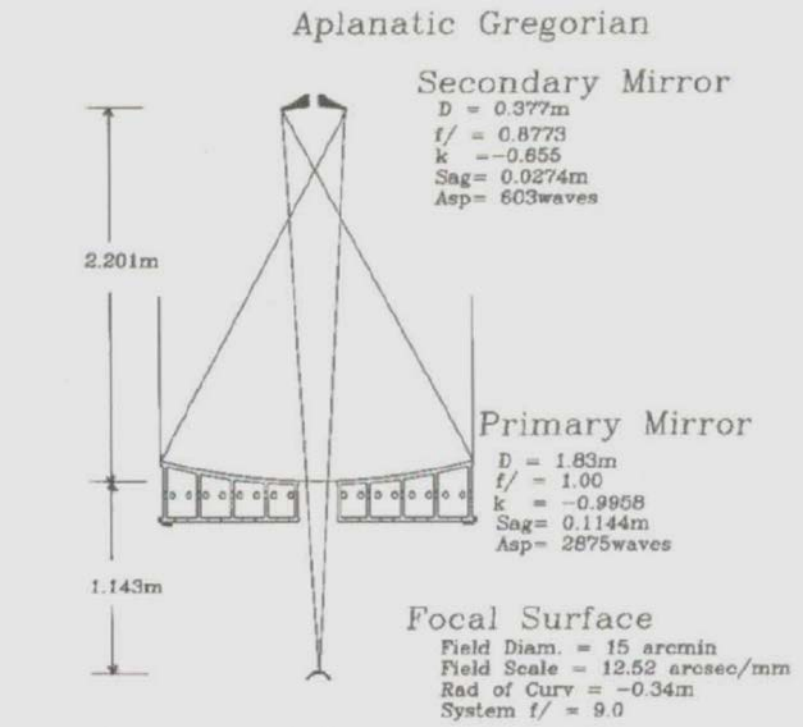
The telescope's capabilities are a good fit to the very long-term observational program the VO has taken on. The VATT is ideally suited to the measurement of light curves. These are sets of images that are collected over a period (anywhere from minutes to years), to measure how different objects' brightness change over time. From these light curves, it's possible to extract

information such as the size and distance of stars or the shape and physical properties of asteroids and Trans-Neptunian Objects.

There are two CCD cameras available for general use with the VATT. The first, the VATT4K, is a conventional astronomical camera designed for photometric surveys and for observing faint objects. The second camera, the Galway UltraFast Imaging [GUFI] camera, is capable of imaging at up to 400 frames per second within a narrow field of view. This camera is suitable for certain variable star studies and other rapidly changing astronomical targets. For photometric studies, there is an eight-color filter wheel which can be used with either camera. And finally, VATTSpec is the newest addition to the VATT's instrumentation: a medium-resolution spectrograph to measure the detailed spectral emission of stars, from which it is possible to infer properties such as their ages, mass, and distance. If I learn more about this interesting telescope, I will report it in a future edition of *IMAGES.*



The VATT and sample images.



VATT4k Imager

Installed	September 2007
Design	Thinned back-ill. CCD (AzCam STA0500A)
Size	4032 x 4032 pixels
Pixel size	15 micron (square)
Field of View	12.5' (arc-minute) square
Plate Scale	0.1875" (arc-second)/pixel
Default Gain	1.8 e-/ADU
Read Noise	5.2 e- (nominal)
Well Depth	95,000 e-, 16-bit ADU
Read time	74 seconds (full-frame)
Spectral	300 – 1000 nm (QE >50% from 300 – 860 nm)

Corporate Member News

Photonics Media is the leading source of news and information about photonics. *Photonics Spectra*, our flagship magazine is read worldwide by engineers, scientists and end users. Integrating all segments of photonics, *Photonics Spectra* is unique in that it provides both technical and practical information for every aspect of the global industry.

Photonics.com offers timely photonics-related research breakthroughs, corporate changes and profiles, along with new products and industry events. The site also includes access to upcoming webinars, white papers, our legendary Photonics Handbook and Photonics Dictionary that are widely used in research labs and universities around the globe.

Each year, Photonics Media and SPIE underwrite the Teddi C. Laurin Scholarship, awarded to a deserving student pursuing graduate-level studies in optics and photonics. The scholarship honors the legacy of company founder Teddi Laurin, who dedicated herself to fostering the growth of photonics and led the charge for many years through industry associations and through the award-winning editorial content of *Photonics Spectra*.

Starting with 2019, Photonics Media is pleased to provide marketing support to the OSSC throughout the year. We recognize that supporting associations such as the OSSC will help to bring visibility to important work within photonics and also help to foster the growth of related industries.

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Local Optical News

Teledyne Technologies Inc. and Roper Technologies Inc. have entered into an agreement under which Teledyne will acquire the scientific imaging businesses of Roper for $225M in cash. Roper's scientific imaging businesses include Princeton Instruments, Photometrics, Lumenera, and other brands.
https://www.photonics.com/Articles/Teledyne_to_Acquire_Scientific_Imaging_Businesses

OUTREACH CORNER…

Our outreach activities are at risk because Justin Francis, our Outreach Chair has moved and is unable to organize the two events we had planned. If we do not find a new Outreach Chair or at least a volunteer willing to organize at least one of the events, this will be the first year in many where we have no outreach events. The two planned outreach events, were: at Petco Park in San Diego and the other at the OC Fair & Event Center in Costa Mesa. The first event is the San Diego Festival for Science and Engineering on March 2nd, https://www.lovestemsd.org/. Last year we had about 10 volunteers to help out. We demonstrated polarizers, Fresnel lenses, prisms, color mixing, and fibers. The second event is the Vital Link STEM and Arts Career Showcase which is hosted for three days in April, http://www.vitallinkoc.org/stem-and-arts-career-showcase. Last year we had about 15 volunteers over the 3 days. These two events are a great way of giving back to the community and getting from young children to college students interested in optics. At each event there are hundreds of children who stop by our booth to learn about optics. These events give high visibility to the OSSC, and they give many young people information about optics, technology, and engineering. We need volunteers!

We have an opportunity for a new Outreach Chair and are looking for someone to take over this role. We thank Justin for his contributions and wish him luck going forward.

Outreach & Education

The OSSC is assisting local university students with OSA Student Chapters. Contact OSSC Student Chapter Liaison Alex Small if you would like to support these efforts. Currently, the following universities have on-going chapters: UC Irvine, UCLA, UC Riverside, Cal Poly Pomona, UC San Diego, Caltech.

Aim and Purpose

It is the aim and purpose of this society to increase and disseminate the knowledge of Optics and closely allied sciences, to promote the mutual interests of investigators, teachers and students in these fields, and of designers, manufacturers and users of optical instruments and allied scientific apparatus as well as those who have optics as a hobby and to encourage cooperation and establish acquaintanceship among these persons.

Speakers Bureau

The OSSC has formed a Speakers Bureau, to create a roster of individuals interested in giving talks for student chapters, OSSC meetings, and similar events. If you have something interesting to share with our local optics community, especially career-related topics of interest to students, please contact a member of the OSSC Board of Directors.

Optical Society of Southern California
14271 Jeffrey Road, Suite #136
Irvine, CA 92620

Upcoming Meetings & Events (2019)

Date	Location	Speaker	Topic
February 13 (OSSC Monthly Meeting)	St. Gregory Armenian Orthodox Church, 2215 E. Colorado Blvd., Pasadena, CA	Dr. Andrey Matsko, Chief Technology Officer OEWaves	Advancing Microresonator-Based Photonics Technology at OEWaves
March 13 (OSSC Monthly Meeting)	Kellogg West Hotel and Conference Center, Cal Poly Pomona Campus	Dr. Mark Harfouche Ramona Optics	Gigapixel Imaging for Neuroscience Applications

All events subject to change without notice.

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Mahr
Mendez R & D Associates
Micro Laser Systems
Mindrum Precision
Newport Corporation
Newport Industrial Glass
Newport Thin Film Laboratory
Ohara Corporation
Optic Systems Group
OptiPro Systems
OptoSigma
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