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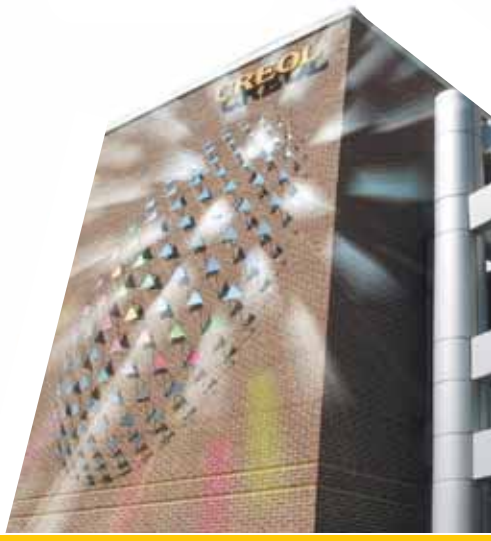
CREOL, The College of Optics & Photonics presents

Highlights



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In this issue:

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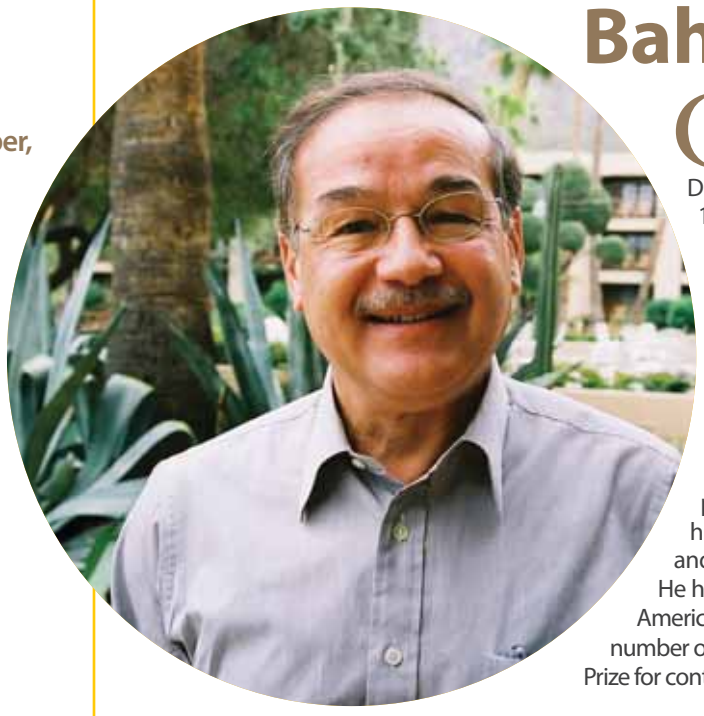
CREOL Welcomes New Dean, Bahaa Saleh



CREOL welcomes its new Dean, Professor Bahaa Saleh. Currently at Boston University, Saleh will take the helm in January 2009, following Dean Eric Van Stryland who has led CREOL since 1999. Bahaa Saleh has been Professor of Electrical and Computer Engineering (ECE) at Boston University since 1994 and was on the ECE faculty at the University of Wisconsin-Madison (UW) from 1977 to 1994. He served as ECE Chair at UW for 4 years prior to his move to Boston University (BU), where he served as ECE Chair for 13 years. Since 2000, he has also served as Deputy Director of the Gordon Center for Subsurface Sensing and Imaging Systems (CenSSIS), an NSF Engineering Research Center. In parallel with these leadership roles, Saleh continued his prolific research career in optics and photonics, and maintained his strong interest in optics education. He has been an active member of the Optical Society of America for more than three decades and is the recipient of a number of other prestigious awards, including the 2006 Kuwait Prize for contributions to optical science.

Continued on page 3

CREOL Helps Propel UCF to 'Top 10' on 'Patent Scorecard' for U.S. Universities

CREOL is "Creating the Future of Optics and Photonics" and a gold mine of intellectual property for UCF. CREOL, The College of Optics and Photonics is one of UCF's leaders in research and patents. As such, CREOL has played an important role in UCF's 2008 Top 10 ranking on the Patent Scorecard for U.S. Universities, which ranks technology innovations gained from patents at U.S. universities. This year, UCF ranked 8th in the nation, jumping from 21st to eighth to surpass Harvard University and the University of Wisconsin in the top 10. No other Top 10 university realized a greater increase in ranking.

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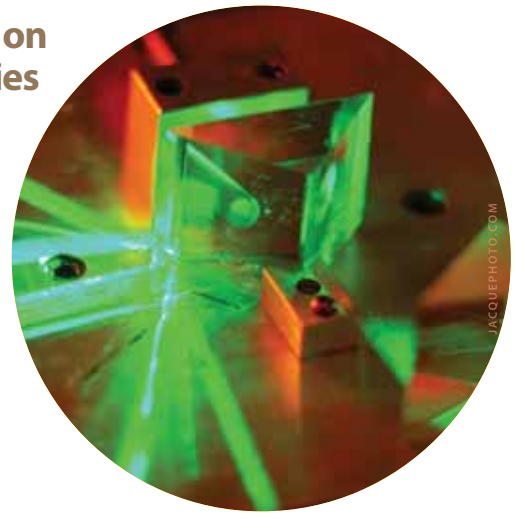


University of Central Florida

"It's an honor to welcome Bahaa Saleh, the new Dean of CREOL, The College of Optics & Photonics."


Eric sails off to a vision of great adventure.

I am overjoyed to return to my faculty duties full time, and also extremely pleased to be able to turn our College over to Bahaa Saleh whose considerable administrative experience, superb academic credentials coupled with an outstanding reputation and kindly demeanor bode so well for our future. Did you know that he was awarded the Esther Hoffman Beller Award of the OSA for outstanding contributions to optical science and engineering education, the Kuwait prize for his contributions to optical science (which also comes with a substantial monetary award), the 2004 SPIE BACUS award for his contribution to photomask technology, and it was recently announced that he will also receive OSA's Distinguished Service Award? OSA's executive director, Elizabeth Rogan, said, "OSA is delighted to honor the top professionals in the field of optics, Bahaa Saleh is a pioneer who has made invaluable contributions to the research, education and understanding of optics. OSA congratulates him on his achievements." As our founding director MJ Soileau has always said, "we at CREOL strive to hire people better than we are." We have succeeded in hiring our new dean! I look forward to continuing to help CREOL succeed in the future under Bahaa's leadership.

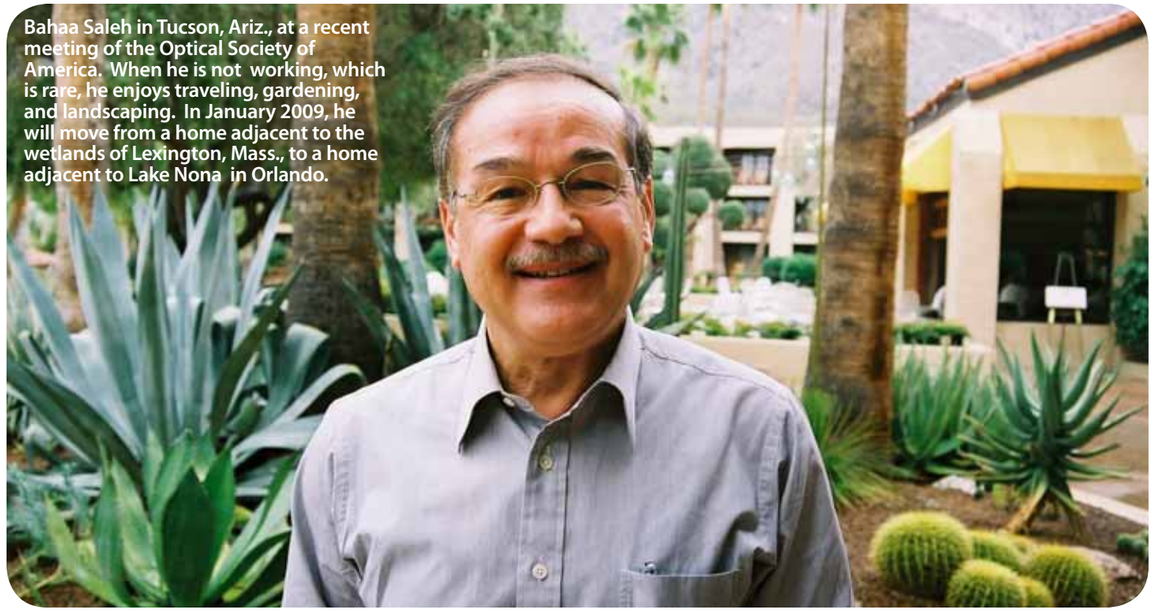
I have been kept busy recruiting new faculty through both the FPCE positions and the Townes Laser Institute positions. I am happy to announce that Ayman Abouraddy from the Massachusetts Institute of Technology has just joined us, and Sasan Fathpour from the University of California at Los Angeles will be joining CREOL in the near future. Normally I would have had an article on Ayman in this issue; however, I will let Bahaa introduce him to you in January. Bahaa and I have already started working together and it has been a pleasure collaborating with him. The article on Bahaa in this issue gives information on his career and interests. Let me just mention that I first met Bahaa in the very early years of CREOL when we tried to recruit him as a chaired professor. That's about the time when he went to Boston University (we weren't yet developed enough!). I later got to know him much better at OSA when we were both on the Board. He was always very deliberate and thoughtful in giving opinions. I also talked to him many times about joining us as dean and he said no (nicely) on several occasions, but we recruited several people to continue to ask and he finally visited. I think he may have been a bit surprised at how much we had grown and changed since our first attempts so many years earlier. In any case, we tweaked his interest and he now sees the tremendous opportunities for the future of CREOL, the Florida Photonics Center of Excellence, the Townes Laser Institute and of course our College of Optics and Photonics.

George Stegeman officially retired during the summer, but we still see him often and expect to continue to see him in the future. He is working hard on a new nonlinear optics (NLO) text, and was kind enough to give me all his new lecture notes for when I teach NLO this spring! Thanks George! George has had a wonderful career and I hope has fond memories of his time at CREOL. His former students and post docs came this summer from as far away as Japan to say thanks and honor him. The daily interactions will be sorely missed!

I also want to add a comment about the wonderful news that UCF is ranked #8 in the country in the generation of intellectual property (see page 1). Looking at the patents issued and patents pending at UCF it turns out that CREOL has contributed ~50% in both categories – a remarkable accomplishment.

Time is moving rapidly towards January when I resume my duties as a full-time faculty member. I am counting the days to when I will no longer need to apologize to my graduate students for not spending all the time that I should with them – although I must admit that the students have done fine with only limited time from me! I took this opportunity to ask two of my former students to send a short writeup of what they have been doing both professionally and personally since they left CREOL. Richard DeSalvo, graduated in 1993, and his paper on second-order cascading was one of the top 25 cited papers in Optics Letters and really re-started the field of cascaded second–order nonlinear optics, which led to many other new phenomena. Tiejun Xia, got his degree in 1994, and he invented the "EZ-scan" which allowed measurements of nonlinearly-induced phase distortions of λ/10,000! Read about both in this issue's Alumni Corner. It was a pleasure to work with these students in the early days of CREOL, and now it's a pleasure to see their success and the success of all of my 28 former students!

Dr. Eric Van Stryland, Dean
CREOL, The College of Optics & Photonics


Bahaa Saleh in Tucson, Ariz., at a recent meeting of the Optical Society of America. When he is not working, which is rare, he enjoys traveling, gardening, and landscaping. In January 2009, he will move from a home adjacent to the wetlands of Lexington, Mass., to a home adjacent to Lake Nona in Orlando.

CREOL Introduces New Dean, Bahaa Saleh

(continued from cover)

Earlier this year Saleh received the OSA Distinguished Service Award "in recognition of his distinguished service to the Optical Society and the optics and photonics community, and for leadership in the area of publications."

Professor Saleh was born and raised in Cairo, Egypt. After receiving a Bachelor's degree in electrical engineering from Cairo University in 1966, he came to the US for graduate studies at The Johns Hopkins University. He received a Ph.D. in 1971 with a thesis on the topic of optical coherence theory and its applications to light scattering. Between 1971 and 1977, he held appointments at academic and research institutions on several different continents, including the University of Santa Catarina in the Island of Florianópolis in south Brazil, the Max Planck Institute in Göttingen, Germany, Kuwait University, and the School of Optometry at the University of California-Berkeley. He then settled in Madison, Wisconsin for 17 years.

His research has generally been concerned with the fundamental nature of light, particularly classical and quantum fluctuations, and their role in applied optics. The extent of his expertise in optics and photonics research, and in optical science and engineering education, is unusually broad and the scope of his contributions is impressive.

Coherence and Photon Statistics. Saleh's early research focused on developing statistical models suitable for describing the fluctuations of light and photon arrival times, as well as methods of statistical inference that combat these fluctuations in applications such as optical communications, spectroscopy, and image science. He pioneered models describing compound random phenomena, e.g., combined classical and quantum uncertainties, and cascaded random processes such as excitation-emission processes in luminescence. His work on doubly-stochastic models culminated in an influential book, Photoelectron Statistics with Applications to Spectroscopy and Optical Communication, Springer, 1978. Together with his long-time collaborator, Professor Malvin Teich, he co-authored a seminal review article on shot-noise-driven doubly stochastic Poisson point processes, which was published in the Proceedings of the IEEE in 1982 and highlighted on the cover of the March issue. In 1980, he became Associate Editor of the Journal of Optical Society of America (JOSA) for coherence and statistical optics, and continued this role for JOSA-A, when it was founded in 1984, until 1990. He was elected Fellow of the IEEE and OSA, and of the Guggenheim Foundation, for his contributions to coherence and statistical optics.

Optical Amplifiers and Detectors. Professor Saleh extended doubly-random models to multiply random models that incorporate dynamic phenomena, such as birth-death-immigration photon-multiplication processes in optical amplifiers and electron-hole ionization in avalanche photodiodes (APDs). With his former student Majeed Hayat, now Professor at the University of New Mexico, he solved a long-standing problem in assessing the effect of dead space (the minimum distance a charge carrier must travel under an applied electric field before it can effect an impact ionization) on the gain, noise, and time response of APDs. Now widely used by the APD device community, this model predicted performance improvements in multilayer structures and APDs with thin multiplication regions, which are designed to meet the requirements for high-speed lightwave systems. The model was also used to characterize the breakdown behavior of APDs and their use as single-photon detectors (Geiger mode) as well as the statistics of time dynamics and its effect on intersymbol interference (ISI).

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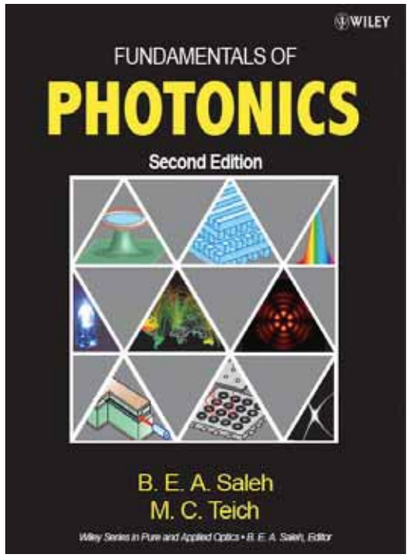
CREOL Introduces New Dean, Bahaa Saleh
(continued from p. 3)

Image Science. Saleh's early work in image science dealt with the description of partially coherent image formation in terms of bilinear systems, much like the description of coherent and incoherent imaging in terms of linear systems that is usually considered in Fourier optics. While most of the image processing community in the 1980's addressed image restoration problems by means of a linear model of distortion together with an additive Gaussian model of noise, Saleh was the first to develop physics-based image-restoration algorithms for partially coherent imaging systems, as in microdensitometry and microscopy, using a bilinear model and photon-noise-limited measurements. He also founded a new area of image processing, Image Synthesis — now known as Optical Proximity Correction — a technique that has become an important tool in modern lithography. When imaging systems are operated near their resolution limit, deliberate changes may be made in the original image (e.g., masks used for microlithography) such that the blur introduced by the imaging system is cancelled out. To solve this problem, Saleh and his students used techniques of real analysis, projection on convex sets, algebraic methods, and integer programming. In 2004, he received the BACUS Prize "for contributions to photomask technology including establishing the foundation on which modern optical proximity correction is based."

Nonlinear Optics. Professor Saleh also led research in various areas of nonlinear optics, including photorefractive phenomena, parametric processes, and multiphoton absorption. For example, he discovered that the Goos-Hänchen effect (lateral and focal shifts associated with the phase conjugation of laser beams) exists in photorefractive media and exerts a profound effect on the modes of photorefractive resonators. He discovered a paradoxical nonlinear effect in which the reflectivity of a phase-conjugate mirror increases with increase of linear absorption, and demonstrated the first optical stochastic resonance (an enhancement of the signal-to-ratio by the addition of noise!). His research in nonlinear parametric processes dealt with various aspects of spontaneous parametric down-conversion, including the production of light with an extremely broad spectrum that serves as an optical source for applications such as submicron optical coherence tomography (OCT). His research in multiphoton absorption includes the development of a new technique for spectroscopy engendered by entangled-photon absorption and an experimental study of two-photon photoemission in multialkali semiconductors. He was recently part of a team of engineers, physicists, and chemists, funded by an NSF program, called xyz-on-a-chip, that fabricated three-dimensional micro-objects in polymers via multiphoton polymerization. The team fabricated metallic microstructures, including the first micro-inductor.



Quantum Optics. Professor Saleh has carried out research in the domain of quantum optics for more than two decades. His research has dealt with the generation of light that exhibits nonclassical properties, such as reduced uncertainty of the field components (squeezed-state light), reduced photon-number fluctuations (sub-Poisson light), and entanglement — a fundamental property of quantum physics that has generated enormous interest and intrigue since the publication of the Einstein-Rosen-Podolsky paper in 1935 on the paradoxical conflict between quantum theory and local reality.

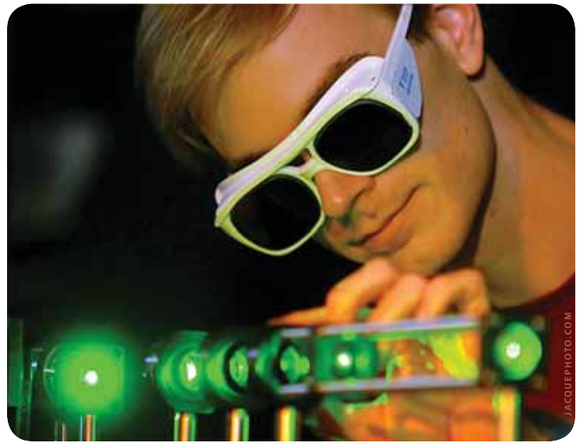
In 1983, Teich and Saleh were the first to experimentally generate unconditionally sub-Poisson photons. They used a sub-Poisson stream of electrons in a vacuum tube to generate photons by inelastic excitation of a gas in a space-charge-limited version of the classic Franck-Hertz experiment. Shortly thereafter they proposed semiconductor versions of this approach, which were subsequently demonstrated. In a series of experimental and theoretical papers published in the early 1990s, Saleh and Teich, together with their students, explored various aspects of two-photon interferometry at beamsplitters and Mach-Zehnder interferometers.

In the mid 1990s, Saleh, together with Professors Teich and Alexander Sergienko, founded the Boston University Quantum Imaging Laboratory. The team used entangled photons generated by spontaneous parametric downconversion as a workhorse for many key studies that elucidated the nature of two-photon spatial, temporal, spatiotemporal, and polarization entanglement. In a seminal paper in 2000, they established a duality between the intensity coherence function of thermal light, which has been used since the 1950's to measure the angular diameter of stars, and the two-photon wave function. This paper was co-authored by Ayman Abouraddy, a doctoral student at the time, and now Assistant Professor at CREOL. At a symposium in 2004 celebrating the 50th anniversary of the publication of the Wolf equations, which describe the laws of propagation of coherence functions, Saleh presented an invited talk showing that the two-photon wave function obeys the very same Wolf equations. Together with his colleagues and students, Bahaa Saleh also developed a number of quantum-optics applications. They proposed entangled-photon microscopy as a potential adjunct to two-photon microscopy. They established entangled-photon spectroscopy as a possible means for extracting spectroscopic information on atomic and molecular transitions, including virtual states. They also proposed and demonstrated quantum optical coherence tomography (QOCT) as a technique for axial imaging that is immune to group-velocity dispersion by virtue of quantum dispersion cancellation. Using this technique, they recently demonstrated 3D imaging of biological cells. Quantum imaging is another application that exploits the spatial correlation between photon pairs. His team studied various configurations for coherent imaging and optical processing, including holography. Two-photon light has played a key role in quantum information, and one of the principal applications is quantum key distribution (QKD). In collaboration with BBN Technologies and Harvard University, the group demonstrated QKD in an actual fiber-optic network in the Boston area. They also demonstrated that the concept of decoherence-free subspaces is applicable to QKD.

Education. Saleh has made outstanding contributions to optical science and engineering education through imaginative teaching and innovative curricular development, both at UW and BU. He has also contributed to optics education nationally and internationally through book writing, reviews, tutorials, and continuing-education short courses. He served as academic advisor to two dozen Ph.D. students, many of whom are currently holding key positions at academic and industrial institutions worldwide. At BU, he established an MS degree program in photonics, and he leads the Center for Subsurface Sensing and Imaging Systems, which has a strong educational program in optical sciences. He participated in several curricular development programs, and is presently the principal investigator on an educational grant entitled "Learning an Integrated View of Engineering (LIVE)," which is funded by the Course, Curriculum, and Laboratory Improvement (CCLI) program at NSF. Perhaps his most significant contribution to photonics education is his popular textbook, "Fundamentals of Photonics," with Malvin Teich (Wiley, 1991, second edition 2007). This comprehensive tome (1177 pages), which is regarded by some as the "bible" of photonics, has been translated into German, Japanese, and Czech, and is currently being translated into Russian. In 1999, Saleh was awarded the Esther Hoffman Beller Award of the Optical Society of America "for outstanding contributions to optical science and engineering education."

Distinguished Service for OSA. Bahaa Saleh has been associated with the Optical Society of America (OSA) since 1980. He has continuously served in various editorial positions and/or publications-related activities, including periods during which he was Editor-in-Chief of the Journal of the Optical Society of America-A (JOSA-A), Chair of the Board of Editors, Chair of the Publications Council, and, more recently, Founding Editor of OSA's new journal, Advances in Optics and Photonics — a journal of reviews and tutorials. During these years of leadership in OSA's publications programs, two new journals were successfully launched (Optics Express and the Journal of Optical Networking), OSA journals continued to have high impact factors, time to publication was reduced, OSA Optics Infobase was launched, and the transition to online journals was successfully implemented. Bahaa Saleh has played a leading role in setting the editorial and peer-review policies and guidelines for all OSA publications.

A New Role at CREOL. "I feel great about my new role and I look forward to the new challenge," said Saleh. He continued: "The College of Optics and Photonics has outstanding faculty and superb centers that bridge various aspects of the discipline. I would like to maintain this level of excellence and I foresee future growth in critical areas. I anticipate renewal of positions that are expected to become open by retiring faculty with new junior faculty of the very best caliber. We also need to attract the best and the brightest students. Consolidation and enhancement of relations with the College of Engineering and Computer Science, the College of Sciences, as well as the new College of Medicine, will be one of my principal goals. Teaming up with other colleges will help us rapidly acquire critical mass in emerging areas. I would also like to foster new paradigms of optics and photonics education that complement our excellent curricular programs. Preparing students to function well in the technological world is essential, and maintaining our strong links with industry and forging new links will continue to be of paramount importance."



CREOL Helps Propel UCF to 'Top 10' on Patent Scorecard for U.S. Universities

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The University of Central Florida joined prestigious research universities such as the Massachusetts Institute of Technology and Stanford University in the top 10 of this year's "Patent Scorecard." The Patent Scorecard 2008 determines the strength of a university's patents as measured by how frequently they are cited in subsequent patents. The rankings are published in the September issue of *Intellectual Property Today*. The rankings are further evidence of Central Florida's emergence as a high-tech innovation center and as a key component of the Florida High-Tech Corridor, which extends from Kennedy Space Center, through Orlando and across to Tampa and St. Petersburg. "The work we're doing at UCF is being utilized by research scientists worldwide," said M.J. Soileau, vice president for Research and Commercialization at UCF. "In this key measure of innovation, that we are among national leaders such as Stanford and MIT, reflects the creativity of our faculty and our strategy to focus on key areas of research, graduate education and partnership."

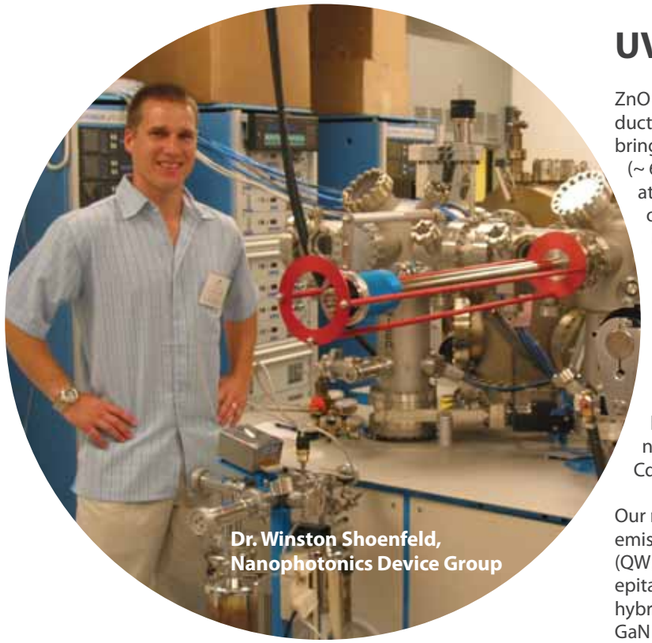
The recognition signals that UCF's innovations are leading the way in the extremely competitive world of developing companies that produce high-tech, high-wage jobs. For example, Raydiance, a laser technology company developed by Peter Delfyett, a professor at CREOL, UCF's College of Optics and Photonics, has raised $27 million in venture capital and was described by *BusinessWeek* as producing one of the top ten disruptive technologies in the nation. Raydiance has an office in the Central Florida Research Park. The University of California system tops the Patent Scorecard and is followed by MIT, the California Institute of Technology, Stanford University, Rice University, the University of Texas, New York University, UCF, the University of Wisconsin and Harvard University.

To view The Patent Scorecard, go to www.iptoday.com/articles/2008-9-oldach2.asp.

Research Focus:

WINSTON SHOENFELD, PROFESSOR OF OPTICS & PHOTONICS, NANOPHOTONICS DEVICE GROUP

Oxide Semiconductors: A new route towards optical & electrical devices



When one mentions oxides, one of the last things that come to mind is semiconductors or conductivity. In fact, "oxide semiconductors" itself seems more like an oxymoron than an actual class of materials. A more conventional thought is that oxides represent protective coatings, insulators, or simply the thin layer of material that forms the critical electrical isolation in the gate of transistors. The fact is that we have now come to appreciate that there are many subsets of oxides that offer semiconducting properties, and only recently has there been a significant surge in research to exploit many of the unique properties that they offer. In this article we present two of several research efforts that are ongoing in the Nano-photonic Device Group here in CREOL.

UV/Visible Light Emitters

ZnO alloys represent the most researched of the oxide semiconductors. There is a long list of benefits that this material system brings to the table, its extremely large exciton binding energy (~ 60 meV) being perhaps the most cited. Among other attributes are its ability to be wet etched, giving it an edge over its GaN sister, and the ability to be alloyed with either Mg or Cd to shift its 365 nm UV band gap to shorter or longer wavelengths, respectively. Our research group is part of a team that has pioneered CdZnO semiconductors using radio frequency plasma-assisted molecular beam epitaxy (rf-MBE). We have demonstrated the ability to tune the energy gap of CdZnO through the entire visible range (λ= 365 – 620 nm) for Cd concentrations up to 30%. While several groups have reported on light emission from heterojunction MgZnO/ZnO light emitting diodes (LEDs), no group has yet reported on multi-quantum well (MQW) CdZnO visible LEDs.

Our recent research has focused on demonstrating visible light emission from ZnO devices containing CdZnO quantum wells (QW). We have studied two basic designs: hybrid and full-oxide epitaxial structures, although we restrict our discussion to the hybrid devices in this article. Hybrid structures rely on a p-type GaN underlayer, upon which the CdZnO QW active region is grown, followed by an n-type ZnO overlayer. This is done to avoid some of the difficulties that continue to remain in finding a stable p-type doping strategy for ZnO. An optical image of light emission from a hybrid CdZnO LED is shown in the inset of Figure 1 for a forward bias of 20 mA.

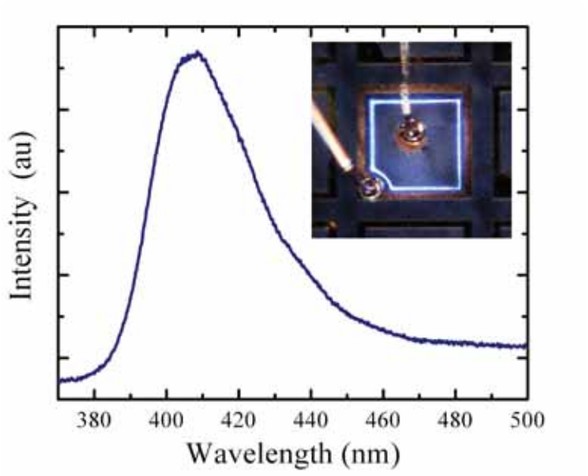


Figure 1: Electroluminescence data and optical image (inset) from a CdZnO quantum well LED.

Bright blue emission was observed, as evidenced by the electroluminescence data taken at 50 mA (Figure 1), centered around 410 nm. Light emission is weighted towards the outer edges of the mesa, indicating a much lower conductivity of the p-GaN underlayer in comparison to the n-ZnO top layer. While this could be compensated for through refinement of the structure or post processing such as substrate removal and transfer, the group efforts have shifted toward full-oxide LEDs, where we have already demonstrated light emission from MQW CdZnO structures and plan to present our accomplishments shortly in a journal publication.

Non-volatile Memory Using Resistive Switching

Oxide semiconductors can also offer much more than light emission. Nickel oxide (NiO) is a well characterized wide band gap semiconductor material whose properties have been investigated for at least four decades. With a direct band gap energy of approximately 3.8 eV, NiO is visibly transparent and exhibits one particularly unique characteristic, resistive switching. Resistive switching, first observed in NiO in 1964, may offer a new route towards nonvolatile resistive random access memory (ReRAM) devices of high density and low power consumption. Recent advances in plasma assisted molecular beam epitaxy and other growth techniques have rekindled scientific interest in this material not only for its potential photonic applications but also for its potential use in ReRAM.

Interestingly there is still controversy among the scientific community as to the source of the resistive switching. Initially it was proposed that the physical mechanism responsible for the resistive transition was a thermal effect resulting in highly conducting localized filaments forming within the NiO between the metal contacts of the device. An initial voltage sweep forms weak filaments through a localized Joule heating effect. The voltage at which this occurs is the "set" transition to the ON resistive state, and is on the order of a few Volts. With another voltage sweep over the same range, the previously formed filaments are ruptured by high power densities in the "reset" transition to the OFF state. Given that the reset transition occurs at a lower voltage, the filaments can then again be reformed by applying the set voltage. More recently it was proposed that the negative resistance and switching mechanism is a result of electron conduction through metallic nickel defect states existing at deep levels along with polariton hole hopping conduction. The exact mechanism for the resistive switching remains in controversy; however, current advances in film growth capabilities have opened up new possibilities to better study the source of the resistive switching phenomenon through control of the microstructure and defects within NiO thin films.

In our group, we have demonstrated resistive switching in polycrystalline NiO deposited on silicon substrates from room temperature to several hundreds of degrees Celsius using rf-MBE. To measure the resistive switching, metal-semiconductor-metal (MSM) devices were fabricated using an interdigitated finger geometry of Platinum electrodes. An optical image of a fabricated MSM device is shown in the inset of Figure 2. The spacing between the electrode fingers is 2 μm, and has not yet been optimized for ReRAM applications. Figure 2 shows a typical hysteresis loop that captures the On and Off-states of the device. Initially in the Off-state, the ReRAM has a resistance of roughly 5 kΩ. When the applied voltage exceeds the SET voltage of 7.5 V, the device transitions to the On-state, with a resistance of about 10 Ω, representing a change in resistance of roughly three orders of magnitude. The ReRAM will remain in the on-state until a voltage just over 6.5 V is applied (the RESET voltage), causing the ReRAM to drop back into its Off-state with the 5 kΩ resistance. If the SET voltage is exceeded, the ReRAM can be once again transitioned into its On-state.

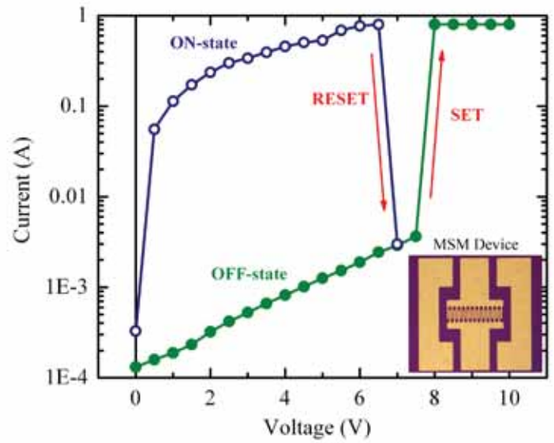


Figure 2: Resistive switching in a polycrystalline NiO thin film and optical image of the MSM device.

Our future research aims to gain a better understanding of the mechanisms that are responsible for the resistive switching phenomenon and to use this understanding to miniaturize and optimize the design of the ReRAM cell. Additional activities will include alloying NiO with other binary oxides and developing optically transparent NiO ReRAM that is compatible with flexible electronics. Information about the full range of our group's research is on the CREOL web at http://npdg.creol.ucf.edu/ .

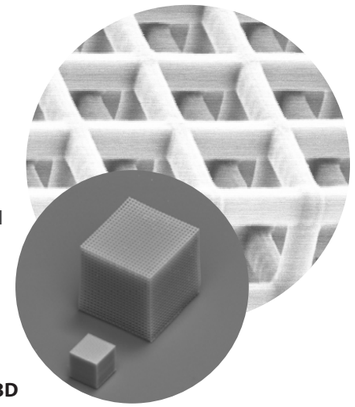
CREOL Faculty

The College of Optics & Photonics

Dr. Steve Kuebler, faculty advisor and leader of the Nanophotonics Materials research group, awarded NSF CAREER Grant

In January 2008 Dr. Stephen M. Kuebler and the Nanophotonic Materials Group (NPM) Group were awarded a CAREER Grant by the National Science Foundation. This award (no. 0748712) is supported jointly by the Division of Materials Research and the Chemistry Division of the Mathematical and Physical Sciences Directorate. The award, entitled "CAREER: Three-Dimensional Multi-Scale Metallodielectric Materials", provides support over a period of five years for the investigation of new processes for creating optically functional three-dimensional metallo-dielectric meta-materials. All members of the NPM group helped collect the preliminary data that supported the proposal leading to this award.

The NPM Group focuses on discovering and developing new materials, processes, and devices for optical and photonic applications. This group is particularly interested in developing new nano-composites having useful optical and electronic function; methods for patterning materials and devices on nanometer and micrometer length scales; and techniques for three-dimensional (3D) nano- and micro-fabrication.



Scanning Electron Microscopy image of a 3D photonic crystal created by the NPM Group.

CREOL's New Dean, Bahaa Saleh, wins OSA's Distinguished Service Award

Dr. Bahaa Saleh was recently awarded Optical Society of America's Distinguished Service Award in recognition of his distinguished service to the Optical Society and the optics and photonics community, and for leadership in the area of publications. "OSA is delighted to honor the top professionals in the field of optics," said Elizabeth Rogan, OSA executive director. "These awards are given to the science pioneers that have made invaluable contributions to the research, education and understanding of optics and photonics. OSA congratulates them on their achievements."

Saleh's broad contributions to the field of photonics include areas such as statistical and quantum optics, optical communication and signal processing, nonlinear optics, photodetectors, image processing, and vision. His publications record is equally extensive; he has authored two books *(Photoelectron Statistics* and *Fundamentals of Photonics)*, chapters in seven books, and more than 500 papers in technical journals and conference proceedings. Saleh has also served as editor-in-chief of the *Journal of the Optical Society of America*, Chairman of the Board of Editors of the OSA, and Vice President of the International Commission of Optics. Most recently, Saleh was named the editor of *Advances in Optics and Photonics*, a new online journal of the OSA that will begin publication in 2009.

CREOL Events & Student News

2008 Alumni Reunion at CLEO/QELS, San Jose, California

Summer/Fall 2008 Graduates

Ph.D.s:

Ying Zhou
Leo Siiman
Hyungseok Bang
Franklyn Quinlan
Ozan Cakmakci
George Curatu
Jeremiah Brown
Kye-Sung Lee
Gilad Goldfarb
Sarper Ozharar

Masters Degrees:

William Hageman
Kevin Stilwell
Luis Dussan
Laura Klein
Charles Williams
Zachary Roth
Sharad Bhooplapur
Meizi Jiao
Andreas Schmidt
Ismael Quijano
Carissa Say

Best Paper Award/2008 LEOS Summer Topical Meeting in Acapulco given to Gilad Goldfarb and Prof. Guifang Li

Congratulations to Gilad Goldfarb, PhD Optics student, and his advisor, Prof. Guifang Li for winning the Best Paper Award at 2008 LEOS Summer Topical Meeting in Acapulco, Mexico for their paper, "Experimental Demonstration of Fiber Impairment Compensation using the Split-Step Infinite Impulse Response Method", by G. Goldfarb, M. G. Taylor and G. Li. The award was sponsored by Ciena which awarded $500 to the first author, who must be a student.

David Haefner Wins 2008 Incubic /Milton Chang Student Travel Award

David Haefner -- a student of Dr. Aristide Dogariu -- is one of the 19 winners of the 2008 Incubic/Milton Chang Student Travel Award. Funded by an endowment from Milton and Rosalind Chang, this program provides grants of up to $1000 each to enable students who present papers to travel to CLEO and the Frontiers in Optics/ OSA Annual Meeting. Grants are awarded to the presenter and usually the first author of the paper. For information on the award and other winners, visit http://www.osa.org/aboutosa/grants/studentgrants/changgrant/default.aspx

CREOL Leads S&T Program for Middle School Students Focusing on Forensics at UCF Summer Science Camp

Local Central Florida middle school students are analyzing fingerprints, footprints, and DNA at the ExxonMobil Bernard Harris Summer Science Camp held at the University of Central Florida's main campus. The two-week camp, which concluded June 25, focuses on forensics. Students attend classes in natural science, engineering, mathematics and technology in the morning and participate in hands-on activities in the afternoon. They go on two field trips, including one to NASA/Kennedy Space Center. "The purpose of the program is to encourage students to pursue a math or science career," said Mike McKee, the camp organizer, Greater Orlando GK-12 Program Director and staff member at CREOL, "We want them to see that science can be fun."

Alumni Corner

CREOL ALUMNI UPDATE

• We have changed the alumni website! http://www.creol.ucf.edu/People/Alumni.aspx so that when you log on with your password (available with an e-mail from this webpage) you can find your colleagues' current e-mail to contact them, as long as all of you give that input! So please log in and keep connected.

• Don't miss out on the CREOL Alumni Survey! We'd like to find out what you are doing and what was most useful to you from graduate school in your jobs. Please send these back to us as they will be valuable to future CREOL alumni.

• If you didn't have a chance to see Dr. Charles Townes' lecture here when the Townes Laser Institute was founded, you can see it on YouTube at http://www.youtube.com/watch?v=dDFhjHv7XDU Well worth your time!
—Eric Van Stryland

(far left) CREOL Alumnus, Vince Kovarik, Ph.D., Computer Engineering, '94

Dr. Richard DeSalvo and the Harris team (above) testing in the desert near Yuma Proving Grounds.

Richard DeSalvo

Richard DeSalvo graduated with a Ph.D. degree in Physics in 1993 with a thesis entitled, "On Nonlinear Refraction and Two-Photon Absorption in Optical Media." DeSalvo worked under the supervision of Dr. David Hagan and Dr. Eric Van Stryland. His paper on second-order cascading was one of the top 25 cited papers in the Optics Letters and has redefined the field of cascaded second–order nonlinear optics, which led to spatial optical solitons and many other new phenomena. DeSalvo currently is a Principal Investigator at Harris Corporation and Manager of Technology Studies and R&D Projects for Harris Corporation's Government Communications Systems Division. His responsibilities include coordinating Division research and development activities supporting multi-divisional and multi-disciplinary technical initiatives for DARPA and other Government research laboratories. DeSalvo's technical areas include optics and photonics for high-speed lightwave communication systems, RF photonic sub-system insertion, optical arbitrary waveform generation, next generation wireless networks for future military systems, Dynamic Spectrum Access in Tactical Radio Networks, and development of soft x-ray sources for decontamination against biological pathogens. His technical management roles involve identifying and maturing multi-divisional new technology start-ups and managing a significant budget to support this activity.

During his first few years at Harris, Richard was a Staff Engineer in the Electro-Optics Department and worked in coherent analog fiber optic system development using 1300 nm frequency stabilized Nd:YAG lasers. During this time, he co-developed a simple, but novel technique to generate double sideband suppressed carrier modulation formats for analog signals as a means of increasing the SNR of sensitive fiber optic links. Dr. DeSalvo was the Chief optical Systems engineer on a major Harris Government program and a Group Leader for 12 engineers and technicians. In 2001, he was the Senior Scientist for JDS Uniphase Transmission Systems. Richard is one of the founding associates for Harris Corporation's mentor/protégé program working with engineers in the Center for Excellence for Optics and Photonics. In his spare time, Richard is an avid surfer and skateboarder and shares these sports with his 10-year-old daughter Drew who was born on Eric Van Stryland's birthday. Richard married his girlfriend, Tina, whom he met when he started at CREOL. The best part is that Dr. Eric Van Stryland's wife, Barbara, married Richard and Tina in their lakeside backyard in November 1993.

CREOL graduate Dr. Tiejun Xia organized the first industrial round table meeting and the formation of the industrial forum AFCS (Advanced Fiber Connectivity & Switching) in San Diego early this year.

"CREOL is just like a big family, the faculty sincerely helps students with whatever they need, the professors are very open-minded to students' new ideas..."

—Tiejun Xia, Ph.D.

Tiejun (TJ) Xia

Dr. Tiejun (TJ) Xia holds his Ph.D. degree in Physics (Nonlinear Optics) from the University of Central Florida. Dr. Xia's thesis, directed by Dr. Eric Van Stryland and Dr. David Hagan, is entitled "Modeling and Experimental Studies of Nonlinear Optical Self-Action." Since graduating from UCF in 1994, Xia has contributed significantly to the fields of photonic technologies and optical communications. Currently, Xia is a Distinguished Member of Technical Staff at Verizon Communcations where his responsibility is optical network technology development. Recently, Xia became a Leaders Circle Winner, when as a team leader, he accomplished the world's first 100G field trial with live traffic. At the recent Optical Fiber Communication (OFC) Conference, it was announced that this is the fastest field test ever for live video streaming. (See http://www.ofcnfoec.org/media_center/ofc_releases/08release5. aspx). Dr. Xia has developed the Symmetrical Innovation System (SIS) to promote innovation in large corporations, and build the Verizon Innovation web site. Prior to Verizon, Xia worked for Chorum Technologies and MCI Communications. Xia is also co-founder of the newly formed industrial forum "Advanced Fiber Connectivity & Switching." An Adjunct Professor in the School of Engineering and Computer Science at UT Dallas, Xia has published more than 100 technical papers and holds more than 30 granted or pending U.S. patents. He is Mentor Advisor at STARTech Early Ventures at Dallas and has developed several programs to promote innovation and creative thinking in the local communities. "One of my hobbies is working with my daughter Amy on our website www.PostSmarts.com. I work on the Chinese version, and she works on the English version," said Xia. "The unique goal of the web site is to convert ordinary people into geniuses :)."

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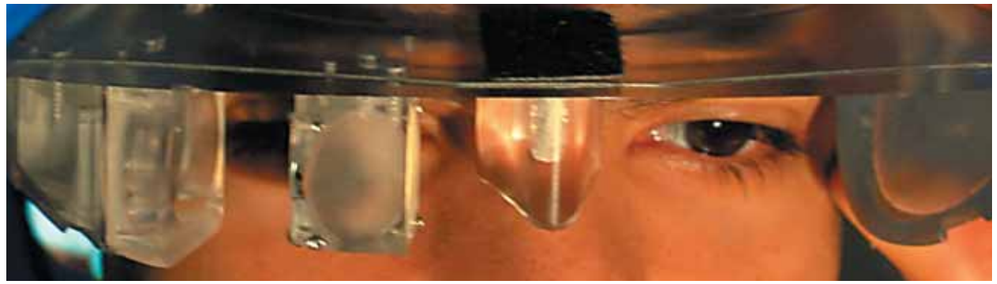

For details on the Industrial Affiliates program, visit www.creol.ucf.edu/Partnerships/Affiliates

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University of Central Florida
CREOL,
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Optics and Photonics

Eric W. Van Stryland, Dean
Jenna Reiser, Editor/Marketing Communications Manager
4000 Central Florida Boulevard
BLDG 53
P.O. Box 162700
Orlando, FL 32816-2700

To subscribe: www.creol.ucf.edu/about/highlights
www.creol.ucf.edu
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CREOL, The College of Optics and Photonics
4000 Central Florida BLVD
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