CREOL Welcomes Four New Faculty Members

CREOL is happy to announce that four new faculty members are joining us during the 1993-94 academic year. Dr. Kathleen Cerqua-Richardson (Chemistry, and Mechanical and Aerospace Engineering) and Dr. Patrick Li Kam Wa (Electrical and Computer Engineering) took up their appointments as Assistant Professors at the beginning of the fall semester. In January of 1994 Dr. Aravinda Kar (Electrical and Computer Engineering) leaves his position as Associate Director of the Center for Laser-Aided Materials Processing at the University of Illinois to join CREOL and UCF as Assistant Professor. Dr. Peter Delfyett will become an Associate Professor of Electrical and Computer Engineering in January 1994, leaving the Bell Communications Research Division of Bellcore. The addition of these faculty will strengthen CREOL in optical and IR materials, laser processing of materials, optoelectronic devices, and all-optical switching and optical interconnects. A biography of each follows.

Patrick Li Kam Wa received his Ph.D. in 1987 in Electrical Engineering from the University of Sheffield, England. His Ph.D. topic was “Nonlinear Propagation in GaAs/GaAlAs Multiple Quantum Well Photorefractive Waveguide Structures.” Li Kam Wa was the first to demonstrate all-optical switching in coupled waveguides using GaAs/AlGaAs multiple quantum well waveguides.

Following two years as a Research Associate at the SERC Central Facility for III-V Semiconductor Materials at the University of Sheffield, Li Kam Wa began a three year appointment as Research Scientist and Adjunct Assistant Professor of Electrical Engineering at CREOL/UCF. Working with Alan Miller, Li Kam Wa continued his work in all-optical switching, realizing further success in this field.

Li Kam Wa plans to expand this work in several areas: implementation of all-optical switching circuits monolithically on chips; design, fabrication and characterization of all-optical switching integrated optic devices with gain; and the development of new ultrafast solid state laser sources.

Currently he is looking at the physics of multiple quantum well optoelectronic devices with a view to enhance the speed of these devices. Using engineered semiconductor...

See New Faculty, page 5

Annual Affiliates Day Announced

CREOL will hold its annual Affiliates Day on January 14, 1994. It will begin at the Holiday Inn near CREOL.

The day-long event consists of technical overview briefings for industry and government colleagues and tours of the CREOL labs.

Make plans now to attend, and look for a letter containing detailed information soon.
The big news from this corner is that the name of CREOL has been changed from the Center for Research in Electro-Optics and Lasers to the Center for Research and Education in Optics and Lasers (CREOL). This name change is coincident with the approval (at long last!) of the CREOL charter. The basic reason for the name change is that we wanted to add Education, since that is our major function. CREOL faculty define the curriculum, teach the courses, and supervise the students for the M.S. and Ph.D. optical physics concentration in the Department of Physics and for the M.S. and Ph.D. Electro-Optics option in the Department of Electrical and Computer Engineering. Most of the research in the Center is done by our students as part of their graduate learning experience. (You might say this is the ultimate in constructive learning.) Our faculty also teach in undergraduate minors programs of various departments and teach undergraduate introductory courses for science and non-science majors. CREOL was established as part of Florida's plan to build its technology-based economy, and the most significant way we can do this is to educate students so that they are capable of producing in internationally competitive businesses.

The other big change at CREOL since the last Highlights is the addition of four new faculty members. This issue features the new folks and describes their varied backgrounds and experiences, so I will not repeat that information here. Just a few words of note: Kathleen brings expertise in glass science to CREOL, Patrick and Peter round out our optoelectronics activities, and Aravinda gets us firmly into the laser application field (an area that we have been looking to hire in since the beginning of CREOL). These new faculty are the result of a very aggressive recruiting year during which we interviewed many exceptional candidates. These four are the ones that we determined best fit the needs of CREOL. We eagerly look forward to their contributions to CREOL's activities and welcome them and their families to Central Florida.

Along with the new arrivals, we have one departure—Dr. Alan Miller’s return to his native Scotland. We are sorry to see Alan, Sussie, and their girls go, but wish them well and look forward to many years of continuing collaboration with Alan and others at St. Andrews. I will be forever grateful to Alan for his contribution to CREOL in the formative years and will continue to treasure the friendship that predates both his and my arrival at CREOL.

A final few words about one of my hobbies. This year marked 25 years for the annual Boulder Damage Symposium. This meeting, which is more or less run out of CREOL these days, has been a major part of my professional life and its 25th was a great opportunity to see old friends and renew old acquaintances. It is interesting to note the changing nature of this gathering, which was spawned by Cold Warriors trying to figure out how to make optics that would help keep lasers from self-destructing. This year's meeting was marked by the participation of eight persons from the former Soviet Union and two from the People’s Republic of China. The meeting has become more international over the years, with 50% of the attendees from abroad. In addition to my Administrative Assistant, Donna Wilson (who actually runs the conference as its Secretary Treasurer), various folks important to CREOL have played a significant role in this meeting over the years, including Martin Stickley, a co-founder of the meeting; Mike Bass, a speaker at the first meeting; and, of course, Art Guenther, member of the CREOL External Advisory Board and the life force behind the meeting. The entire laser community owes a debt of gratitude to Art for his leadership in the never-ceasing effort to improve laser optics. Thanks, Art.
Miller Accepts Professorial Chair

Dr. Alan Miller left CREOL in August to begin his new duties as Chair of Semiconductor Physics at The University of St. Andrews, Scotland. In his new position he will devote his energies and expertise to building a new semiconductor research program in parallel with current research on solid state, ultrashort pulse, tunable and metal vapor lasers within St. Andrews Physics Department. The move offers opportunities for Dr. Miller to further enhance his work in the areas of optical properties of semiconductors, ultrafast laser interactions and carrier dynamics, low dimensional semiconductor structures, ultrashort pulse lasers, nonlinear optics, optoelectronic devices and all-optical switching, for which he is already well known.

The University of St. Andrews was founded in 1410 and has a long history in optics, lasers and semiconductor sciences. David Brewster, who gave his name to Brewster’s angle and was the inventor of the Kaleidoscope, was a Professor at St Andrews. The department recently received a great deal of publicity for the first observation of self-mode-locking and ultrashort pulse generation in the Ti:sapphire laser. Collaboration already exists between CREOL and St. Andrews on model-locking of Cr:LiSAF. This prestigious institution is located on the east coast of Scotland.

The town of St. Andrews, with a population of around 12,000, is a major tourist mecca offering an ancient castle and abbey, and is acknowledged as the home of golf, which has been played on the seashore dunes of the North Sea, just a stone’s throw from the Physics Department) since the 15th century. The Royal and Ancient Golf Club of St. Andrews still holds responsibility for the rules of golf. Visitors to the Physics Department can borrow the set of golf clubs donated by Nobel Prize winner John Bardeen after his stay in the department. The Royal Burgh of St. Andrews is located in the county Fife, (often still referred to as “the Kingdom of Fife” because of its ancient status) and is Dr Miller’s home county. He expects the biggest differences in his life to be the contrast in the scale of things in Scotland compared to the USA and the better weather enjoyed in St. Andrews compared to Florida! (He is however very grateful for the thick UCF sweatshirt presented to him by his graduate students on leaving CREOL).

Dr. Miller anticipates continued collaboration with his colleagues at CREOL and looks forward to visiting frequently. He is formally on leave of absence from UCF with four graduate students, a research fellow and several continuing research grants at CREOL. He is hoping to be able to initiate regular extended visits of students between the two institutions.

International Scientists Visiting CREOL

Dr. W. Bohn, Deputy Director of the Institut of Technical Physics in Stuttgart, Germany, visited CREOL in July. Dr. Bohn participated in the AIAA meeting and then visited with CREOL faculty with special interests in nonlinear optics.

Zeev Taubenfeld of Raefael Research Institute, Haifa, Israel, joins the Thin Film Group at CREOL for a nine month sabbatical. Taubenfeld works in the development of optical coatings such as anti-reflective coatings, mirrors, and filters primarily for application in night vision.

Dr. David Salzman is completing a year long appointment with the Laser Plasma Group at CREOL. Salzman has been working on theoretical dense plasma production with ultra-high intensity lasers. He will be leaving CREOL to join the University of Pittsburgh for a three month appointment, but will continue collaborations with CREOL/UCF.

Dr. Masataka Kado of Osaka University, Institute of Laser Engineering, Osaka, Japan, has joined the Laser Plasma Group at CREOL for a three year appointment as a fellow of the Japan Society for the Promotion of Science. Kado is an expert on laser plasmas, x-ray diagnostic, and x-ray optics. While with the Laser Plasma Group, he will be working on x-ray sources and x-ray microscopy of biological specimens.
Talks & Papers Presented/Published

Papers Published

Presentations:
New Faculty (Continued)

materials, he is studying the motion of free carriers in multiple quantum well structures affecting the optical properties of these materials, which are used in modulators and optical switching devices. Li Kam Wa is collaborating with AT&T Bell Labs and the U.S. Army Electronics Power Sources Directorate on these projects. Li Kam Wa will continue his work in all-optical switches in waveguide forms, working to improve hybrid optoelectronic computing and other fast communication switching technologies.

Another project currently underway, in collaboration with Lexel Lasers and NEOS, is the development of an end-pumped LiSAF regenerative amplifier which will provide amplified femtosecond pulses at a repetition rate greater than 10 kHz. Developments in this area will lead to the marketing of an all-solid-state regenerative amplifier to boost the power of ultrafast lasers.

Kathleen Cerqua-Richardson, a 1992 graduate of Alfred University, New York, performed her Ph.D. work in relaxation processes and their effect on time-dependent variations in the physical properties of infrared glass optical fibers. Cerqua-Richardson's experience ranges from laboratory engineer at the Laboratory for Laser Energetics at the University of Rochester to Visiting Scientist with the Hoya Corporation in Tokyo, Japan. She held a post-doctoral position with the Naval Air Warfare Center, with work performed at UCF.

Cerqua-Richardson found it was a natural progression for her work in ceramics to develop into materials research. As the only ceramist working in an optics lab, she recognized the union of the two disciplines, materials and optics, would be beneficial to science and industry. Her current work further illustrates this successful discipline merger.

Presently, she is investigating the processing (chemo-mechanical interactions) and manufacturing issues associated with the development of computer-automated fabrication of IR optics. Her experience in optical materials spans both visible and infrared glasses and crystals, and her interest in new IR dome and window materials has stimulated her research program at CREOL.

Cerqua-Richardson considers herself an applied scientist, a "trouble-shooter," and anticipates using her extensive experience in materials characterization techniques to assist industry in enhancing the durability of laser materials. A proposal is underway with Lightning Optical, Tampa, to study the "Long-term Durability of LiSAF Crystals." Future plans include collaboration with other CREOL scientists to develop a Materials Research Lab for research in characterization of sol-gels and polymers, and the development of nonlinear glass films for optical switching applications.

Aravinda Kar received his Ph.D. from the University of Illinois at Urbana-Champaign. His thesis, entitled "Multiregion Thermal Analysis of Finite Rod Bundle Systems," was a study of modeling conduction and convective heat transfer and fluid flow in nuclear reactors.

Kar plans to expand his current work in the areas of laser welding, laser ablation, and laser cladding and coating in his laboratory at CREOL. He plans to establish research in the areas of laser processing of materials, ceramics, and semiconductor optoelectronic materials. Other developments are materials processing at low gravity to study the effect of diffusion, surface tension and gradient flow.

In manufacturing developments, Kar hopes to continue to expand his work in laser cladding and coatings. Both cladding and coating are useful to modify surface properties.

Cladding, the process of applying a thick surface to a core material, provides extra strength to materials with a reduced cost. Coating, a thin film technology, provides similar benefits. Other studies in manufacturing applications include laser drilling, cleaning, glazing and heat treatment. He also hopes to continue the development of diagnostic tools for Laser Aided Manufacturing and Materials Processing (LAMMP). He will also introduce studies in thermo-mechanical and thermo-chemical LAMMP.
New Faculty (Continued)

Kar plans to develop more thin film technologies for materials testing and defect correction. Development of thin films with wear resistant properties, such as anti-corrosion and anti-oxidation, would be beneficial to automotive and aerospace industries.

Kar looks forward to collaborations with other CREOL faculty in the areas of fiber optics, high resolution and high precision measurement techniques, laser matter interactions and laser beam propagation.

Peter Delfyett received his Ph.D. from the City University of New York. He began his research career as a member of the technical staff at Bellcore, directing his efforts toward making extremely compact light sources, using semiconductor lasers, for use in optical interconnect and communication systems.

Using his experience in high-speed optoelectronics, Delfyett plans to build on new and existing photonic and opto-electronic technologies to enhance current data and information processing systems with novel opto-electronic devices. Primary goals are to improve performance in processing information faster and more efficiently.

He has been successful in photonic network applications, such as the optical clock he co-developed at Bellcore. The optical clock uses a compact, semiconductor "mode-locked" laser to project the signal accurately through 1,024 circuit boards with accuracy to 12 trillionths of a second. Delfyett's other interests in high-speed electronics include optical computing and novel methods for using optics to provide increases in memory applications.

Delfyett's research will complement projects currently underway at CREOL, such as Li Kam Wa's and Stegeman's work in all-optical switching, and Richardson's and Silfvast's work in short pulse high-power laser sources. Guenther's Thin Film Lab will complement Delfyett's work in optical memory sources.

In summary, the addition of these four faculty members will fortify the existing work of CREOL and further strengthen our ability to meet the challenges of the future. High-speed optical communications and computing, durable optical materials, and laser-aided manufacturing suggest a new "industrial revolution," and CREOL is positioned and equipped to continue to lead the way.

CREOL Director Travels to Russia

M. J. Soileau, Professor of ECE and Physics and Director of CREOL, represented UCF at two prestigious optics meetings this summer in Russia.

Dr. Soileau gave talks at the Seventh Conference on Laser Optics in St. Petersburg and the Workshop on Computer Simulations in Nonlinear Optics (CSNO '93). He traveled from Saratov to Moscow as part of the "Volga Laser Tour '93" Conference.

Dr. Soileau visited several laser and optics institutes as part of the agreement of scientific exchange between UCF/CREOL and the General Physics Institute of the Russian Academy of Sciences, Moscow, and a NSF joint grant with the S. I. Vavilov State Optical Institute, St. Petersburg.

Talks/Papers (Cont.)

At the 25th Annual Symposium on Optical Materials for High Power Lasers, October 27-29, 1993, Boulder, CO:
Van Stryland, E.W.; M. Acharekar and L. Morton Jr., Schwartz Electro-Optics, Inc., Orlando, FL, "2 Micron damage and 3-6 micron optical parametric oscillation in AgGaSe,

Soileau, M.J.; M.N. Libenson, V.S. Makin, V.A. Shiryaev, All- Russian Research Center "S. I. Vavilov State Optical Institute," Birzhevaya liniya 12, St. Petersburg, Russia, "Participation of laser-induced waveguide modes in optical damage of transparent dielectrics."


Soileau, M.J.; O.M. Efimov, and V.S. Popikov, Research Center, "S.I. Vavilov State Optical Institute," St. Petersburg, Russia; S.V. Amov, General Physics Institute of the Russian Academy of Sciences, Moscow, "Influence of radiation polarization on optical breakdown threshold of glasses by two beams."


Short Courses Taught

Dr. Karl H. Guenther has been invited to chair a session on Manufacturing Topics Including Materials and Processes at the SPIE International Symposium on Optical Interference Coatings in Grenoble, France, June 6-10, 1994.

Dr. Karl Guenther has been elected a Senior Member of the Laser Institute of America.
Graduates and Awards

Richard DeSalvo received his Ph.D. in Physics in August, 1993. His thesis was entitled "On Nonlinear Refraction and Two-Photon Absorption in Optical Media," and research was performed under the guidance of Drs. Van Stryland and Hagan. Dr. DeSalvo has accepted a position as Lead Engineer with Harris Corporation, Melbourne, FL.

Charles Bogusch was selected by the Physics and Space Sciences Section of the Florida Academy of Sciences to receive an Outstanding Student Paper Award for his presentation at the 57th Annual Meeting held at Eckerd College March 24-27, 1993. His paper was entitled, "Femtosecond Pulse Generation in a Ti:Sapphire Laser at Extended Wavelengths." Mr. Bogusch performed this research under the guidance of Dr. Martin Richardson, and graduated with a Master's Degree in Electrical Engineering in August, 1993.

Eric Von Schetzen, an undergraduate Electrical Engineering student, graduated Summa Cum Laude in August. He participated in the National Science Foundation Research Experience for Undergraduates program in Laser Development and Applications at CREOL, and was a member of the Laser Plasma Laboratory on various aspects of x-ray generation with laser plasmas. Eric plans to pursue graduate study.

Dave Hayden returned to Wright Labs, Eglin AFB after spending a year with Dr. Boreman studying wavelength-tuning effects in infrared laser diodes.

Congratulations to the following students on these scholastic milestones:

- Passing the Physics Ph.D. Qualifying Exam, Fall 1993
  - Paul Tesch
  - Teng Chen
  - Howard Bender
  - Arthur Dogariu

- Candidacy Exams, Summer 1993
  - Frank Effenberger, EE
  - Peggy Perozzo, Physics
  - Drew Pommet, EE

Notes from the CREOL Student Chapter of the OSA

The CREOL Student Chapter of the Optical Society of America was featured in an article on Education in the November issue of Optics & Photonics News. As reported in the Spring issue of Highlights, the Chapter has been visiting high schools and making presentations entitled "Introduction to the World of Optics." The presentations were aimed at senior physics classes and included topics such as laser beam refraction, and demonstrations with a tunable helium-neon laser, prisms, diffraction gratings, and fiber optics. As noted by Drew Pommet, flexibility in the content of the presentation was key to the success of the lectures. The team of Pommet and Ducharme demonstrated that every age can be enriched by optics when they visited the multi-level class (K-1 students) at the Creative School for Children at UCF.

The Chapter was proud to support the Central Florida Blood Bank at their semi-annual trip to campus on October 11. Over ten pints were donated by CREOL members.

Also, OSA members took a break from their grueling academic schedules to prepare a float for the UCF Homecoming activities.

Lecture Series Presented by Dr. T. Izumitani, Hoya Research Corp.

Dr. Tetsuro Izumitani, retired Vice President for Research, Hoya Corporation, Tokyo, Japan gave an extended series of lectures during August and September at CREOL.

Dr. Izumitani is best known in the United States for his textbook, Optical Glass. This work has been translated from Japanese into English, Chinese, and Korean since its first printing in 1984. Izumitani has won many awards for his work at Hoya Glass and is a pioneer in the development of laser glasses.

Dr. Izumitani presented lectures to UCF faculty and participants from local optics companies.

Dr. Izumitani's visit, hosted by Dr. Kathleen Richardson, Assistant Professor of Chemistry, and Mechanical and Aerospace Engineering, was part of an extensive visit to the U.S., including an extended visit at the University of Rochester.

CREOL Faculty Participate in NATO Advanced Study Institute, Sicily

Professor Alan Miller of CREOL and the University of St. Andrews, UK, served as a member of the organizing committee for the NATO Advanced Study Institute on Nonlinear Optical Materials and Devices for Applications in Information Technology as part of the 26th International School of Materials Science and Technology held in Erice, Sicily in July.

This school invites top scientists in related optics fields to participate in the annual event. CREOL member, Dr. George Stegeman, Cobb-Hooker Chair and Professor of Physics and ECE, presented lectures on the application of nonlinear optical materials in waveguide directional couplers.

Total attendance at the Advanced Study Institute was 82 participants from 21 countries.
## New CREOL Contract and Grant Awards

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**TOTAL**                                                                 | 2,395,391

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CREOL  
University of Central Florida  
12424 Research Parkway  
Orlando, Florida 32826