September 2003

UCF School of Optics
CREOL & FPCE

HIGHLIGHTS

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Excellence in Research and Education in Optics and Photonics

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New Nanophotonics Faculty Member:

Pieter Kik

by Eric Van Stryland

We are very happy to announce that Dr. Pieter Kik from the California Institute of Technology has accepted an offer to join our faculty in the School of Optics. He arrives here September 1, 2003. He is currently a researcher in the group of Harry Atwater. Pieter obtained his PhD in the group of Albert Polman in The Netherlands while working on integrated optical amplifiers.

At the School of Optics's new Florida Photonics Center of Excellence, Pieter will set up a research program in the area of Nanophotonics. Nanophotonics is a very rapidly growing research area. It deals with the use of so-called nanostructured optical materials, with which we can manipulate light in extremely useful ways. The key idea is that we can obtain dramatic changes in the behavior

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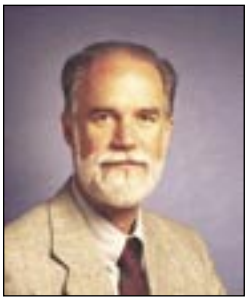


Eric Van Stryland

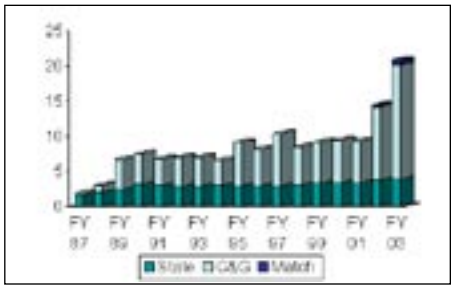
In the last issue of Highlights I said; Hurray! We will be receiving $10M from Governor Jeb Bush's initiative to establish the Florida Photonics Center of Excellence (FPCE)! Last week we got the money $$! Thank you Governor Bush and thank you State of Florida Legislature, the Emerging Technology Commission, the Florida High Technology Corridor Council, the Florida Photonics Cluster and the rest of the Florida Photonics industry and all of our partners. There are so many people to thank. Now comes the work! We are just now sending our invitations to industry leaders to become members of our Industrial Advisory Board, (IAB). We will try to hold our first IAB meeting at the same time as the Grand Opening with Governor Jeb Bush in attendance. See the article in this issue on both the Inauguration and Affiliates Day.

Renovation of space in the CREOL building for the nanophotonics fabrication facility has begun with DAW Technologies Inc. serving as the prime contractor. Completion is expected Dec. 1, 2003.

We have already begun to hire faculty members with expertise in nanophotonics and will be looking for biophotonics expertise in the near future. Dr. Pieter Kik will join us from Caltech September 1. (see front page article). We also have hired Stephen Kuebler from the University of Arizona, and Kurt Busch from the University of Karlsruhe, Institute for Theory of Condensed Matter in Germany. Both will have joint appointments with the School of Optics, Stephen with Chemistry and Kurt with Physics. Articles on their research expertise in nanophotonics will be published in a future issue.

A quick look at the graph below will give you some idea of what the faculty have been up to lately – writing proposals and successfully getting them funded! C&G stands for contracts and grants. I should also add that last year there were 40 industrial contracts at $4,353,210. And the $10,000,000 for the FPCE counts for next year!

We will be hosting the Optics in the SouthEast (OISE) meeting on Photonic Devices, Optical Materials, Micro and Nano Optics November 12 - 13, 2003 in the UCF Student Union. For more information see http://www.osa.org/meetings/topicals/oise. We encourage you to come to this meeting, present a paper and/or exhibit. The National Fiber Optics Engineers Conference, NFOEC (ITcom) will be held Sept 7-11 at the Orange County Convention Center. See http://www.nfoec.com for details. ITCom 2003: Information Technologies and Communications, organized by SPIE, The International Society for Optical Engineering, will collocate with NFOEC. Detailed information on ITCom 2003 can be found at www.spie.org/info/itcom.



STUDENT NEWS

Mike Mielke won this year's New Focus top prize, ie "GRAND Prize with $10,000", at CLEO in Baltimore. This is the second year in a row a School of Optics student won the grand prize! I was there to listen to all 6 talks, and Mike and Joel Hales not only gave superb talks, but I think I can state without bias, the BEST talks (a number of people came to me to tell me this)! Joel won a runner up prize of $2,500 as well! Congratulations to Mike and congratulations to all of us at the School of Optics/CREOL & FPCE. I don't think it is possible to calculate the importance of this form of recognition on all aspects of the operation of the School, e.g. in recruiting - both students and faculty. Mike and Joel "did us proud"!

Other students also won awards. For example, 5 CREOL students were awarded SPIE scholarships: Ceyhun Ackay, Daniel May-Arrioja Mircea Mujat, Claudia Mujat, and Laurent Vassie.

FACULTY NEWS

Peter Delfyett was awarded EDC Metro Orlando's individual Technology Innovation award at the Schwartz Industry Innovation awards on the 27th of July. UCF President John Hitt presented the award. Congratulations Peter!

Peter Delfyett and Glenn Boreman were recently selected to be University of Central Florida Trustee Chairs. Professor Kevin Belfield, joint appointment with the Department of Chemistry, was awarded the University's Graduate Teacher of the Year Award.

I just returned from SPIE's Annual meeting in San Diego where School of Optics faculty member Emil Wolf was honored with a two-day symposium entitled, "Tribute to Emil Wolf: Engineering Legacy of Physical Optics," where speakers from around the world spoke of how Emil's research impacted optics.

I also attended an industry sponsored reception for School of Optics joint appointees Larry Andrews and Ron Philips who became Fellows of SPIE.

George Stegeman, Cobb Family Chaired Professor of Optics underwent triple bypass surgery a few weeks ago, but we are happy to say he is recovering quickly and will be teaching this Fall semester.

I am very sorry to say that our one time Distinguished visitor Hermann Haus from MIT died on May 21 of a heart attack after arriving home in Lexington from his regular, 15-mile commute by bicycle from MIT in Cambridge. He was 77 years old. http://web.mit.edu/newsoffice/nr/2003/haus.html. Dr. Haus had lectured and collaborated on research projects here at the School of Optics. Our condolences go to his family.

Pieter Kik, from cover

of certain optical elements (such as semiconductor particles; metal films and particles etc.) by changing their shape and size on a nanometer length scale. This type of nanoscale optical design has already led to some surprising results. For example, Pieter and his coworkers at Caltech have recently shown that linear arrays of silver nanoparticles can act as a miniature optical waveguide, in which the optical mode size is much smaller than the diffraction limit. Another example of nanophotonics research is the ongoing work on sub-diffraction limit focusing with planar metal films. It has been predicted that a thin metal film might be used to produce an image of a point dipole with a resolution better than the diffraction limit by using plasmon oscillations at metal surfaces. These and related projects are stirring up great interest from Industry due to potentially lucrative applications in optical data storage, nanolithography, and on-chip optical communications.

Studying the optical properties of nanostructures is neither easy nor cheap. It requires extremely accurate control over the shape and size of materials, as well as high-resolution optical analysis. For sample fabrication Pieter will make use of the nanophotonics fabrication facility that is being built within the CREOL building (~3,000 sq. ft. of class 1,000 and class 100 clean room space.) That construction began July 1. His lab will utilize various techniques that allow for high resolution optical analysis. The centerpiece for Pieter's work will be a Near-field Scanning Optical Microscope (NSOM) that enables the mapping of optical fields with a resolution better than the diffraction limit by locally detecting optical intensity using a scanning nano-aperture.

> Nanoscale optical design has led to some surprising results.

Apart from being a lifelong scientist, Pieter is a music enthusiast. In 1991 he studied playing the oboe at the Amsterdam Conservatory in the Netherlands, and since then he has picked up playing piano and guitar. He also greatly enjoys hiking; and he recently spent a month hiking in the Himalayas. Additionally he has covered thousands of miles on his road bike on several bicycle trips in Europe. He also expects to make regular use of the squash courts at the UCF athletics facilities, and invites all his new colleagues to a friendly game!

NSF REU 2003

The School of Optics enjoyed its 11th summer of NSF-funded undergraduate research with 19 students from the US and France participating. Students from the School of Optics domestic and international programs as well as UCF's NanoPAC program spent a full day at the NASA visitor center accompanied by Craig Siders and Vaidy Vaidyanathan. UCF professor and NASA astronaut Sam Durrance, pictured above with UCF's REU students, graciously gave a special seminar for the students. PARTICIPANTS: Nicolas Barriere, Guillaume Bouvignies, Emily Bruce, Virginie Capdevielle, Jason Carpentier,David Gagnon, Peggy Gonzales, Aude Goury, Jason Karp, Leonard Kisimbi, Rafael Love, Jeremiah Pack, Brian Park, Arnaud Royon, Anne Ryan, Alexander Spier, Amir Tal, Bijun Tan, and Julian Threatt

Summer 2003 Graduates

Peter	Olszak	Non Thesis	Optics MS
Heidi	Hockel	Non Thesis	Optics MS
Andrew	Greenwell	Non Thesis	Optics MS
Erwan	Baleinie	Non Thesis	Optics MS
Clara	Rivero	Non Thesis	Optics MS
Robert	Stegeman	Non Thesis	Optics MS
Islam	Salam	Aravinda Kar	MMAE PHD
Manojkumar	Patel	Aravinda Kar	MMAE MS

UCF Optics Students Win New Focus Awards…Again!

More New Focus Awards to School of Optics Students

At the recent CLEO/QELS 2003 conference in Baltimore, two of our senior graduate students, Mike Mielke and Joel Hales, were in the finals for the New Focus award. Six finalists were selected to present their research at CLEO/QELS in Baltimore and presentation of the awards were made at the plenary session. Mielke won the grand prize of $10,000 for outstanding achievements in semiconductor laser research. Hales, another of our graduate students won a $2,500 runner up prize for his work in nonlinear optics. These prizes are very prestigious. The OSA New Focus Student Awards were established in 1997 with the support of Milton Chang and New Focus, Inc. (NASDAQ: NUFO), to encourage excellence in research at the graduate level and leadership in the optics community. Each Spring, University professors and thesis advisors are eligible to nominate students from among their best students for this very prestigious and lucrative award. The finalists are selected by a committee. This is the second year in a row that a School of Optics graduate student has won the grand prize!

Mike Mielke, grand prize winner of $10,000 for outstanding achievement in semiconductor laser research.

Joel Hales, $2,500 runner up prize winner for his work in nonlinear optics.

Mielke, a graduate student working for Professor Peter Delfyett, has developed a low-cost way of generating multiple beams from one laser without interference. He has a patent pending for his modelocked, multiwavelength semiconductor lasers. An article published in the New York Times in October of 2002 outlined some of this research. Mike says that, "One of the problems with multi-wavelength lasers has been that the individual wavelengths compete with each other — they're kind of noisy. One of the accomplishments of our research is that we were able to come up with a way to suppress that noise." The cost of the multiple laser sources used in competing networking schemes has so far not allowed the development of photonic technology into certain segments of the telecommunications grid. His single laser approach significantly lowers this cost.

> Mielke credits his success to the "great environment"

Mielke has received many prestigious acknowledgements of his past work, including the NSF-sponsored "Graduate Traineeship in Optical Science and Engineering," and UCF's School of Optics Student of the Year Award. He was also a finalist in the Collegiate Inventors Competition for the National Inventors Hall of Fame. Mielke credits his success to the "great environment" of CREOL, his fellow researchers and advisor Professor Peter Delfyett.

Joel Hales, a graduate student working with Professor David Hagan and Eric Van Stryland, presented his work on developing rapid methods for determining and analyzing the two-photon absorption spectra of organic molecules. He will be defending his dissertation and graduating in the near future. Joel is President of the local OSA student chapter, Vice President and Projects Coordinator for our graduate student association: CAOS (CREOL Association of Optics Students). Among his many volunteer efforts he has been instrumental in developing several demonstration projects for the student group CAOS aimed at demonstrating optics concepts to groups of jr. high and high school students as well as educating visitors to CREOL. (See article in our last issue.)

The Optical Society of America Executive Director, Elizabeth Rogan states, The "OSA New Focus Student Award" provides an opportunity to highlight outstanding achievements by students within the field. It's of great importance to give students opportunities to show their best work at this early stage of their careers. OSA, as their professional society, plays a vital role in supporting students in many ways, including this award program. To be recognized at this level is a significant honor and this year's finalists have exemplified the characteristics of leaders within the optics community.

We at the School of Optics certainly agree! Congratulations to Mike and Joel!

Inauguration of FPCE at Affiliates Day 2003

by Patrick Li Kam Wa

The Florida Photonics Center of Excellence (FPCE) was formally introduced as a new Center within the School of Optics during this year's Affiliates Day on April 25, 2003. (See page 2 for more on the FPCE.) The Inauguration ceremony was held during the lunch hour in a pavilion tent set up on the front lawn of the CREOL building. It included the unveiling of a new building marker and presentations by Mr. Richard Crotty, Orange County Chairman; Mr. Randy Berridge, President of the Florida High Technology Corridor Council and also representing the Florida Photonics Cluster; Dr. John Hitt, President of UCF; and Dr. M.J. Soileau, UCF Vice-President for Research. Director Eric Van Stryland also used this occaision to recognize the long-standing contributions of retiring UCF Provost Dr. Gary Whitehouse in helping to create the School of Optics and FPCE. Whitehouse was presented with a laser sculpted Pegasus produced locally using CREOL technology.

Randy Berridge, Chairman Crotty, and President Hitt all spoke eloquently on the significance and importance of the FPCE for the University, the Central Florida/ Orange County region, and the State of Florida.

Left to Right; M.J. Soileau, Eric Van Stryland, Randy Berridge, Richard Croty, John Hitt, and Gary Whitehouse.

Affiliates' Day Events

This year's Industrial Affiliates Day focused on Optical Technologies for Industry and Homeland Defense. The morning session was comprised of talks from a superb mix of experts from Industry, Academia, Government Laboratories, Federal Funding Agencies, including a short speech by a top political figure.

The first talk, by Dr. Tom Baer, President and CEO of Arcturus offered exciting insight into the world of biophotonics and genetic diagnostics. This is an area of technology that provides enormous benefits to mankind and we are still at an early stage of research. Consequently the potential for crucial future breakthroughs in this field is tremendous. Dr. Baer presented some of the most impressive images of genetic engineering enabled by technology developed at Arcturus.

In the second talk, Dr. Peter Delfyett, Distinguished Research Professor of Optics at the School of Optics/CREOL described the major achievements of his research team in the generation of short duration modelocked pulses from semiconductor laser diodes. He presented applications for this technology ranging from high data rate wavelength division multiplexed communications to high frequency optical analog to digital conversion.

Congressman Tom Feeney, US House of Representatives, 24th District of Florida, then addressed the audience and compellingly pointed out the importance of conducting first class research in order to gain and maintain the technological edge for both the country's economic strength as well as its military superiority. Mr. Feeney is a keen supporter of the University of Central Florida and has been active in ensuring that this University receives strong support in order to compete for federal research funding. In particular, the School of Optics is indebted to him for being instrumental in securing funds for a major facility with state of the art fabrication equipment that is currently being established to allow cutting edge research in the field of nanophotonics. Congressman Feeney will undoubtedly continue to be a great supporter of this University.

Dr. Thomas Giallorenzi, Director-Optical Sciences, Naval Research Laboratories then impressed the audience with an overview of the deployment of optical technologies in the military and for civilian protection. His talk was extremely informative and gave a first-hand view of how technology is used to enhance the capabilities of our military forces and law enforcement authorities. Some of the topics presented by Dr. Giallorenzi were reminiscent of themes found in science fiction and spy movies.

Our next speaker, Dr. Dan Herr, Director of Material Process Sciences at Semiconductor Research Corp. described the major advances in lithography that enabled the semiconductor microchip revolution. Today's powerful personal computers would not have been possible without the Very Large Scale Integration (VLSI) attained through the shrinking of the dimensions of the individual electronic components. Lithography is the technique that is employed to transfer design templates into semiconductor wafers. Future improvements in optical lithography will lead to even smaller device features and denser device

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packing and therefore more powerful electronic chips.

The final speaker of the morning Dr. Stuart Wolf, Program Manager – Defense Sciences Office of Defense Advanced Research Projects Agency (DARPA), gave an overview of some of the programs that he manages. His program is rather diverse and covers many potential applications of probing basic science such as using electron spin processes in semiconductors for information storage and electronic processing, communication using quantum coherence and entanglement as well as imaging applications on the nanolevel scale. He is also the program monitor on a project that is funded at CREOL and aimed at producing very high power levels from semiconductor laser diodes.

Afternoon Session – CREOL

Following lunch, Director Eric Van Stryland gave an overview of the current research activities at SO/CREOL. This was followed by a presentation by Mr. Michael Mielke, the winner of the 2003 "Student of the Year Award".

The program then changed to focus on the local industry that plays a key role in support of the technology developments for military applications. Dr. Mark Koontz, Director-Optical Solutions presented some of the research and development being carried out at Harris Corporation in Melbourne. Mr. Daniel Dillery, Director-Avionics Engineering presented some of the technologies being developed by Northrop Grumman AGS&BMS. Dr. Jenkins, Director-Research & Technology, Lockheed Martin M&FC rounded off the afternoon talks by reiterating the importance of a close relationship between local industry and the University.

Immediately following the afternoon talks, our graduate students displayed 20+ poster presentations of their on-going research work. A guided tour of the research laboratories and several select demos highlighting some of the research being conducted by the faculty also ran concurrently. A small panel consisting of our afternoon speakers selected the best student poster and Mr. Cedric Lopez was awarded a $100.00 prize gracefully presented by Mr. and Mrs. Gary Washam. Dr. Eric Van Stryland also presented the Charles Gramm Travel Award to Mr. Hakob Sarkissian.

This very full day of activities ended with a "wine & cheese" reception including an array of delicious hot hors D'oeuvres provided through the generous sponsorship of the Metro Orlando EDC.

CLEO REUNION 2003

Once again alumi, faculty and students gathered for the annual CLEO/ QELS Reunion. This year's event was held at Max's at Camden Yard where numerous alumni, faculty and currents student had the opportunity catch up on research. In addition to alumni and students, the School invites its industrial affiliates to participate in the reunion activities. See you in 2004!

Left to Right: Camilo Lopez, Pascale Parrein, Joachim Meier, Fumiyo Yoshino, and Robert Iwanow.

Left to Right: Arnaud Zoubir and Robert Bernath.

Student Demo at CLEO 2003

A special project at the recent International Conference on Lasers and Electro-Optics (CLEO-2003) in Baltimore this year was a demonstration by a team of CREOL students of a special Refractive Laser Beam Shaper as part of the Newport Corp exhibit. Newport is an Industrial Affiliate of the School of Optics/ CREOL. The three students, Arnaud Zoubir, Robert Bernath and Joshua Duncan spent several weeks assembling and testing the live laser demonstration at CREOL before the conference.

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Invited Papers & Short Courses

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James E. Harvey "UV, EUV, and X-ray Optics", SPIE's 2003 International Symposium on Optical Science and Technology at San Diego, CA on August 3, 2003.

H. Ren, Y. H. Fan and S. T. Wu, "Anisotropic liquid crystal gels for display applications" (Invited Paper) Proc. Int'l Display Manufacturing Conference, 29-32 (2003).

Jannick Rolland "Modeling and Applications for Medical Visualization: Augmented Reality: Aims and Challenges", CASA 03, May 7, 2003. http://dimacs.rutgers.edu/casa03/

George Stegeman "Dissipative Solitons in Semiconductor Optical Amplifiers", Banfi Memorial Workshop, Pavia Italy, June 2003.

George Stegeman "Spatial Solitons in Non-Critically-Phase-Matched Crystals", at NOMA'2003, Cetraro, Italy , June 2003.

George Stegeman "Discrete Beam Interaction in Waveguide Arrays", (presentation by Joachim Meier), IMACS'2003, Athens, Georgia, April 2003.

George Stegeman "Real Optical Beam Instability and Coherent Spatial Soliton Experiments With Non-Ideal Samples and Non Ideal Sources", UCLA Workshop on Emerging Applications of the Nonlinear Schrödinger Equations, Los Angeles, CA, Feb. 2003.

S. T. Wu, "Reflective and transflective liquid crystal displays" ,(Short course) SID Annual Meeting Baltimore, MD, May 23, 2003.

S. T. Wu, "Molecular Engineering of High birefringence Liquid Crystals" (Invited talk) Dow-Corning Midland, MI, June 26, 2003.

S. T. Wu, "Liquid Crystal Modes for LCOS Projection Displays" (Invited talk) eLCOS Microdisplays Sunnyvale, CA, July 30, 2003.

Books

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Patent Updates

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Honors & Awards

A Distinguished Service Award 2003 was presented to Professor **Jannick Rolland** in appreciation of her outstanding contribution and years of dedication to the Lake Highland Preparatory School Aspire Science Education Program.

Dr. Glenn Boreman and Dr. Peter Delfyett have been honored with special promotions; each now hold a University of Central Florida endowed Trustee Chair. For information about the Trustee Chair see http://pegasus.cc.ucf.edu/~provost/TrusteeChairs/home.html.

Dr. Peter Delfyett was presented with a William C. Schwartz Innovation Award from the Metro Orlando EDC, in recognition of his holding the world record for the fastest laser pulse and laser data transmission. Named in honor of laser pioneer and entrepreneur Bill Schwartz, the awards were presented on June 27.

Joel Hales received a New Focus award of $2500, and **Michael Mielke** received the New Focus Grand Prize of $10,000. (See story on page 4)

SPIE Student Awards were received by : **Ceyhun Ackay, Claudia and Mircea Mujat, Laurent Vaissie, and Daniel May-Arrioja**.

Associate Faculty Members, **Larry Andrews and Ron Phillips** have recently been elected Fellows of SPIE.

Our Associate Faculty Member **Dr. Kevin Belfield**, Chemistry Dept., has received the University Excellence in Graduate Teaching Award for 2002-2003.

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