

IEEE PHOTONICS SOCIETY (formerly LEOS) Distinguished Lecturer Experience

Silvano Donati, 2007/08 – 2008/09 Distinguished Lecturer

Title: "Coupling dynamics in semiconductor lasers and applications to self-mixing interferometry and chaotic cryptography"

At the beginning of my term as Distinguished Lecturer, I was fortunate to get the chance to be a Visiting Professor in Taiwan, Fall 2007, so I began my Photonics Society DL tour in the Pacific Rim, usually a region not in easy reach from Europe.

My first lecture was hosted by the Photonics Society Taipei Chapter and took place in Kaohsiung, the second largest city in Taiwan, home to the Institute of Electro-Optical Engineering of the Sun-Yat Sen University, on November 28, 2007. The hosting colleague was Professor Wood-Hi Cheng, Director of the Centre of Excellence in Optoelectronics and Past Chairman of the Photonics Society Chapter, and 40 people attended, half of whom were Photonics Society or IEEE members.

Later on, before leaving Taiwan, I got the chance to repeat my DL speech in Taipei, shortly after the very successful running of another Photonics Society event: the 5th edition of the WFOPC (Workshop on Fiber Optic and Passive Components) a workshop that readers may remember was conducted in 1999 by the Italian Photonics Society Chapter. This time WFOPC was conducted by the Taipei Photonics Society Chapter and hosted in the newly built 6-story Barry Lam Building, inside the Campus of the NTU (National Taiwan University) from Dec. 5 to 7, 2007. The WFOPC was co-chaired by Professor Hung-Chung Chang (NTU) and myself, and attracted about 150 researchers from the Pacific Rim, Europe, Australia, and USA.

In Taipei I gave my DL on December 14, 2007, as part of a "Colloquium" held in connection to the bi-annual review of the Institute of Photonics and Opto-electronics of the NTU (National Taiwan University), and to the celebration of the Photonics Society 30th anniversary. The event attracted about 120 participants and was organized by Professor Shen-Lung (Luke) Huang, Chairman of the



Silvano Donati is a Full Professor at University of Pavia, Italy, since 1981. He is Fellow of IEEE and OSA. He has been the Founder and first Chairman of Photonics Society Italy Chapter. Later, he has been the VP Region 8 Membership, the Photonics Society BoG Elected Member. He is presently the Chair of the IEEE Italy Section. The slide of his DL can be downloaded at the Photonics Society website <http://www.ieee.org/portall/site/leos> clicking Photonics Society University then Distinguished Lecturers.

Photonics Society Taipei Chapter and Director of the Institute of Photonics and Optoelectronics.

The second venue for my DL was the Hong Kong Photonics Society Chapter, where the Chairman Chester Shu, and another friend, Hon Tsang, Pacific Rim Editor of the Photonics Society Newsletter, were kind to welcome me at the Department of Electronic Engineering of the Chinese University of Hong Kong, in the very nice setting of a campus atop a hill overlooking the downtown and Kowloon.

Next, I went to the Singapore Photonics Society Chapter, invited by the Photonics Society Chair Professor Chin Mee Koy who asked me to break my DL lecture in to two parts, one focused on self-mix interferometer applications for an audience of PhD students and PostDocs active in Physics and Electronics measurements, and a second part focused on chaos and cryptography for the communication and ITC engineers. Both lectures were held on December 18, at the School of Electrical and Electronic Engineering of the Nanyang Technological University of Singapore with the organization of Professor Tang Dingyuan, and were

attended by more than 60 participants. In the evening, a 'Photonics Society event' then followed with the attendance of Photonics Society members to celebrate the 30th Photonics Society anniversary. Thus, for me it was the pleasant chance of meeting and becoming acquainted with nearly all the Members of the Chapter, including Professors Pey Kin Leong, Ping (Perry) Shum, Director of the Network Technology Research Center, and Tu Pei Chen, Director of the Division of Microelectronics.

My fifth and final visit of Pacific Rim Chapters was on December 26, when I reached Kuala Lumpur and met Professor Zaini Jamaludin, the Malaysia Photonics Society Chapter Chair, who organized my talk at the MIMOS (Microelectronics and Information Science) Research Center. There, I met Professor Suhairi Bin Saharudin, Head of the Department of Information Security. I was asked to focus my DL lecture on chaos cryptography, because of the research

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interest of the Group at MIMOS, and this was easy for me, in view of the structure of my DL. Then, not surprisingly, I got as many questions as the about 25 attendees listening to my presentation, including a few ladies wearing chador who were then introduced to me as post-Doc researchers working on cryptography. We had also a very intriguing discussion in comparing chaos versus quantum cryptography, the subject developed at MIMOS. Finally, thanks to Professor Jamaludin, I got the opportunity of visiting the laboratories of the just completed University Tenaga (Energy) Nasional, in the outskirts of Kuala Lumpur.

In summary, the experience of lecturing in the Pacific Rim Chapters was very enriching and enlightening. Despite the different native language, the own education path and local economy, it was not difficult for us to understand each other on technical matters and find out that the research interests are the same. Also, Photonics Society was perceived as a glue of the scientific community, overcoming the national and political barriers and providing an essential vehicle for the dissemination of ideas. Compared to current situation of European research, the Pacific Rim 'Tigers' as sometimes the visited Chapter are dubbed, have maintained a broad scope even after the "2002 bubble" and have not decreased their effort devoted to research, both in term of human resources and of funding. In Taiwan, the optoelectronics companies are reporting a steady 2-digit increase in sales in last years, and this has positive fallout on both investments and research. As in the best pre-bubble times, in Taiwan they fear the flow of talents to China and a shortage of engineers at homeland. Somewhere, like in Singapore, research has been targeted to be more application-oriented, and go biomedical, for example, yet the mainstream in optoelectronics and fiber optics is alive and still well funded.

Next, at the end of January I visited two East Coast US Chapters: University of Maryland at College Park, Washington, and Old Dominion University in Norfolk, VA, for my 6th and 7th lectures. In Washington, the lecture was hosted at the Department of Electrical and Computer Engineering by Professor Thomas Murphy, who was good to raise members from local Institution in addition to his own students, including those who had just started to deal with electrooptical generated chaos. In Washington, it was nice to meet Rajarshi Roy, the Director of the Institute for Physical Science and Technology, as well as an old acquaintance, Prof. Mario Dagenais that I knew from the time of our common interest in gyroscopes. The presentation at Maryland University was tailored to be the 'general purpose' one, inclusive of both selfmix and chaos. The same request came from the Hampton Roads Chapter in Norfolk, because of the large percentage of students able to attend. There, also a party of students from the College of William and Mary was participating, thanks to the good office of Dr Irina Navikova I met the week before in Washington. In Norfolk, I met the

joyful Amin Dharamsi, a perfect host and a previous Photonics Society DL, and my lecture was attended by over 60.

Back to Europe, next venue was the Saint Petersburg Chapter by the kind invitation of Vice-Chair Prof. Grigorii Sokolovskii, together with Igor Gurov, Director of the ITMO Institute. The talk, 8th of the DL list, was divided in two parts, of 40 minutes each, and was given at the Research Institute of Optoinformatics at the Saint Petersburg State University on May 9. Attendance was over 30 and much interest was raised both by the selfmix measurements and the optical chaos generation.

Last but not least, in June the Italian Chapter concluded the year and invite me as his past Chairman and Founder, to give the 9th DL at Politecnico of Milano on June 17, 2008. Host in Politecnico of Milano was Professor Cesare Svelto, Chair of Electronic Instrumentation, and the audience of 35 was mainly consisting of engineering master Students, very interested to a subject – selfmix interferometry, that several had already chosen for their final dissertation.

My second term of DL resumed from Italy, my own country, on July 18, 2008. My 10th lecture was hosted at the First University of Roma "La Sapienza" by Antonio d'Alessandro, Professor of Optoelectronics and a well-known researcher in liquid crystal devices. Next, on September 1st, I flew to Glasgow for my 11th DL, invited by the Scottish Colleagues that had already the opportunity of cooperating with us of the Italian Chapter when we organized the workshop on passive components, WFOPC, in 2002. In Glasgow, it was nice to meet Stephane Calvez, the newly appointed Chair of the Scottish Chapter and Chief Officer of the Institute of Photonics, a Research Center with a number of R&D programs at the cutting edge of photonics. Also nice to meet again was Marc Sorel, the Treasurer of the Scottish Chapter, who has been years before a PhD student of mine in Pavia, now recently appointed Senior Lecturer of Glasgow University.

Then, in October, I was back to North America, touring the Chapters located around Lake Ontario. I started with my 12th DL from the Rochester Chapter, and have been hosted by Smith James in the Corning Research Lab facility of Corning, N.Y. giving my talk in the morning of Oct. 20th. In the audience I recognized Davide Fortusini, another bright PhD student at University of Pavia, now re-joining Corning as a researcher in photonics after a period abroad. At Corning, I had the opportunity of visiting the famous Glass Museum, a wonderful collection of milestones marking the evolution of glass, the material and its technologies, since the inception in 1500 BC and through the centuries of civilization.

I moved then to Canada, stopping first in Kingston on the way of my travel to Montreal for my 13th DL. Actually, Kingston has a Section of the IEEE, and is right now planning to establish a Photonics Society Chapter, yet I accepted the kind invitation of Scott Yam and John Cartledge (a Photonics Society DL too) to stop in the afternoon of October 22

Membership Section (cont'd)

in Queen's University to give my talk. There, I collected an audience of 15 researchers and PostDocs of the local Group of Photonics at the Department of Electrical and Computer Engineering. Then, on proceeding to Montreal, I was hosted by Peter Noutsios, Chair of the Montreal Photonics Society Chapter, who gave me the opportunity of giving my 14th DL talk in the afternoon of October 23, at Mc Gill University, where I met Photonics Society Newsletter Associate Editor Lawrence Chen and visited the premises.

The final stop of my Ontario Tour was Ottawa, where Chapter Chair Kexing Liu went beyond arranging for a plain talk: he was able to organize a half-day Symposium on Photonics, on October 24 morning, at the National Research Council building in Ottawa, putting together my 15th DL divided into two parts (on Self-mix Interferometry and on Chaos), the DL talk of John Cartledge, and two more talks of John Howell (University of Rochester) and Xiaoyi Bao (University of Ottawa). The initiative was very successful and collected an audience of 76 attendees from the NRC and the University of Ottawa, quite a remarkable outreach for the Photonics Society.

I shall say that my "Ontario Tour" really enriched me a lot. I shall confess that I was unaware of the remarkable concentration of photonics activity going on there, so that the opportunity of seeing the facilities and be able networking with these distinguished Colleagues was amply rewarding the effort of jumping from one location to the next. Also, once again it was nice to find people that, on meeting me the first time, say that we already know each other because we read and profit from each other papers published by the Photonics Society.

Another unusual venue was then my next visit, the Delhi Photonics Society Chapter in India. I accepted the invitation of the Chairman Prem Kumar and of Bishnu Pal, the Co-chair

of "Photonics 2008", the International Conference held in Delhi from 15 to 17 December. I took part as a Prominent Speaker in a meeting that came a few days after the Mumbai attack. But, it was one more good reason to participate and witness to our Indian colleagues the support and understanding of the international scientific community. Indeed the "Photonics 2008" Conference was well attended, with over 600 delegates, both domestic scientists and students as well as colleagues from abroad, and also the major Photonics Society, OSA and SPIE Directors addressing the Indian colleagues and encouraging them to join the learned Societies.

Next stop in my lecture trip was a comeback to the Photonics Society Chapter in Taiwan, where I stopped for a month of Visiting Professor. So, invited by Chair Professor Luke Huang and by the Director Professor Wood-Hi Cheng at the National Sun Yat Sen University of Kaohsiung, I got the opportunity of giving a full-length version of the second part of my talk, on January 6, 2009, focusing on the applications of coupling phenomena to optical chaos and cryptography. The talk was attended by 45 faculty and students, who asked a lot of questions nearly doubling the talk time.

Last stage of my lecture was the CREOL College of Optics and Photonics of the University of Central Florida, where the Chairman of the Student Chapter Sharad Bhooplapur invited me. The lecture was given on February 9, 2009 and was attended by 28 distinguished scientists and professors, including some friends and colleagues of the Society, notably Bahaa Saleh, Dean of the College of Optics, Peter Delfyett, Nabeel Riza and Shin-Tson Wu. The discussion at the end of the presentation was unusually rich and idea-triggering, once again confirming to me that the time spent in traveling for lecturing is the best spent and supplies a unique chance of networking and disseminating research ideas.

Columns by Photonics Society Leaders Celebrating Fifty Years of Quantum Electronics

Robert L. Byer, Stanford University

The disciplines of Electrical Engineering and Physics came together in the invention of the laser. The joint contributions of these two fields of knowledge was recognized in the 1960s with the creation of a new field of study called Quantum Electronics and embodied in the devices and applications of the laser. The participants in Electrical Engineering and in Physics were represented by the professional societies American Physical Society, The Optical Society of America and the IEEE. Within the IEEE the early technical meetings were organized by the Electron Devices Society. In 1977 the Quantum Electronics and Applications Society was established to

recognize that optoelectronics was rapidly growing and extending beyond the boundaries of the Electron Devices.

My early career followed the merging interests from physics to electrical engineering and applied physics. At the University of California, Berkeley, I studied physics and was allowed to participate in research projects as an undergraduate student in the atomic spectroscopy laboratories of Professor Sumner P. Davis. My early interests in amateur astronomy gave me an edge in laboratory skills that were in demand in optical spectroscopy studies. Later, upon graduation in 1964, it was Professor Davis who recommended that