



SPIE BRUSSELS STUDENT CHAPTER

Activity Report

Period:	April 2006 – December 2006
Advisor:	Prof. Hugo Thienpont
Officers:	Jürgen Van Erps (President), Nathalie Vermeulen (Vice-President), Virginia Gomez (Treasurer), Philippe Tassin (Secretary)

OUTLINE

I. ACTIVITY REPORT

- SPIE Photonics Europe 2006
- BEST Summer School "Photonics: your beam to the future"
- Outreach activities with the NEMO Edukit
- Science Week for high school students
- Access to the SPIE Digital Library
- General meeting and reception

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I. ACTIVITY REPORT

SPIE PHOTONICS EUROPE 2006

1. LUNCH WITH THE EXPERTS

During this lunch, quite some members of our Chapter had some interesting discussion with a former president of SPIE. We first described our personal research, and then discussed topics as the value of a PhD degree in Europe. From the explanations, we learnt that there are large cultural differences between the scientific worlds in Europe and the USA. Universities in Europe are still more independent from companies than American universities.

2. COURSE ON TECHNICAL WRITING

Several members also attended the Short Course on Technical Writing by Sunny Bains, core technical writing lecturer for the Graduate School of Engineering and Physical Sciences and lead tutor in technical communication for the Department of Electrical and Electronic Engineering.

The course was very interesting, although a little bit too introductory, since students at the Vrije Universiteit Brussel are already well trained in technical writing in English. Nevertheless, most members learnt some small tricks to improve their technical English.

3. STUDENT CHAPTER KICK-OFF DINNER

Since almost all members of the *Brussels Student Chapter* were present at the Photonics Europe conference, we have organised our kick-off dinner in a nice restaurant at Strasbourg. Furthermore, some members from the Polish Student Chapter of the Warsaw University of Technology joined us for the dinner.





4. ORAL AND POSTER PRESENTATIONS BY CHAPTER MEMBERS

Mikel Arizaleta	Investigation of polarization properties of VCSELs subject to optical feedback from an extremely short external cavity
Iñigo Artundo	Selective optical broadcasting in reconfigurable multiprocessor Interconnects
Lawrence Bogaert	Prototyping micro-optical components with integrated out-of-plane coupling structures using deep lithography with protons (invited)
Miguel Cornelles Soriano	The influence of current noise on polarisation mode hopping in VCSELs
Ignace Gatare	Nonlinear dynamics and polarization bistability in optically injected VCSELs
Virginia Gomez	Cylindrical microlenses fabricated by deep lithography with protons
Christine Ruwisch	<ul style="list-style-type: none"> • Design, fabrication, and characterization of a low-cost lens-based fiber connector for passive optical networks • Light propagation in a GRIN microlens with gain or loss and comparison with lossless case • Design of a light-guide used for the real-time monitoring of LCDdisplays
Jürgen Van Erps	<ul style="list-style-type: none"> • Prototyping micro-optical components with integrated out-of-plane coupling structures using deep lithography with protons (invited) • Design, fabrication, and characterization of a low-cost lens-based fiber connector for passive optical networks • Roughness measurements on coupling structures for optical interconnections integrated on a printed circuit board • Susceptibility of highly birefringent doped core PCF to thermal and mechanical perturbations • AFM benchmark for the profile characterisation of subwavelength diffractive elements within the EC Network of Excellence on Micro-Optics NEMO

Bart Van Giel	<ul style="list-style-type: none"> • Design of axisymmetrical tailored concentrators for LED light source applications • Efficient illumination in LED-based projection systems using lenslet integrators
Nathalie Vermeulen	<ul style="list-style-type: none"> • Continuous-wave fiber-pumped Cr:ZnSe laser • Iterative resonator model describing the continuous-wave operation of a Raman laser
Michael Vervaeke	Packaging a free-space intra-chip optical interconnect module: Monte Carlo tolerance study and assembly results (invited)

5. BOOTHS AT THE PHOTONICS INNOVATION VILLAGE

Members of the Brussels Student Chapter were involved with two booths at the Photonics Innovation Village, described below.

A. Deep Proton Writing: a rapid prototyping micro-optic fabrication technology

During the last years we explored the potentialities of our in-house developed rapid prototyping technology -Deep Proton Writing- for the fabrication of novel micro-optical structures, components and modules. Today, this technology has fulfilled many of its original promises and now paves the way to rapidly develop many novel components and to make them compatible with mass manufacturing technologies at low cost which up to now was not feasible. At the Photonics Innovation Village we explained how this technology works, and gave an overview of micro-optical structures which have been prototyped up to now. A variety of application areas which we have targeted in the domain of lab-on-a-chip, optical telecommunication, optical interconnects on PCB, and optical sensing were illustrated.





B. NEMO: Network of Excellence on micro-optics

"NEMO" (Network of Excellence on Micro-Optics) is a networking platform of 30 European partners, that aims at providing Europe with a complete Micro-Optics food-chain by setting up durable service and technology centres for Optical Modelling and Design; Measurement and Instrumentation, Mastering, Prototyping and Replication; Hybrid Integration and Packaging; Reliability and Standardization. NEMO is a 6th FP project that is running since September 1st 2004, and a period of 4 years has been allocated for fulfilling NEMO's goals (see <http://www.micro-optics.org/>). The specific involvement of Chapter members in this booth was the demonstration of NEMO's Educational kit (see further in the activity report).

BEST SUMMER SCHOOL *"PHOTONICS: YOUR BEAM TO THE FUTURE"*

1. DESCRIPTION OF THE MAIN ORGANISER

BEST, the Board of European Students of Technology, is a non-profit and non-political student organisation. The organisation is completely run by students, with the purpose of promoting Europe among the European students. Their goal is mainly achieved by organising communication, co-operation and exchange possibilities for students all over Europe.

BEST develops these activities in order to help European students of technology become more internationally minded, reach a better understanding of European cultures and develop the capacity to work on an international basis. They provide European students of technology with development opportunities, while broadening their knowledge of other cultures.

BEST consists of Local BEST Groups (LBGs) scattered across Europe, which are the factories of all events. The LBG Brussels – founded in 1993 – is located at the campus of the Vrije Universiteit Brussel, and works together with the university's science and engineering departments to organise its events.

2. DESCRIPTION OF THE EVENT

Throughout the year, the LBGs organise different activities, of which the BEST Courses are the most important. These Courses are learning events with participants attending lectures given by the university's teaching staff and visiting companies, industrial plants or research centres. Topics of the learning events cover a specific field of technology, economics, or management.

This year, the subject of the LBG Brussels' Summer School was chosen to be photonics, and it has been given the appropriate title "Photonics: Your Beam to the Future." The course was attended by 20 students from almost the same number of European countries. The course consisted of presentations and lectures on photonics, lasers, laser security, optical measurements and modelling of lasers and a lot of practical work aimed on building a free space optical link converting data into laser pulses that are sent 500m further through air.

Participants were not required to have prior knowledge in photonics, so the lectures and the hands-on sessions had to reflect this.

3. CONTRIBUTION OF THE STUDENT CHAPTER

The LBG Brussels asked to the Department of Applied Physics and Photonics of the Vrije Universiteit Brussel to organise the scientific/academic part of the Summer School. This part consists of the following tasks: teaching the theoretical background, training the students during hands-on sessions in optics, organising the construction of an optical link, and evaluating the students with an exam. The lectures were all given by professors of the Department of Applied Physics and Photonics. The other three tasks have been carried out by the SPIE Brussels Student Chapter.

A. Organisation of the Hands-On Sessions

Members of the SPIE Brussels Student Chapter have prepared and supervised the training sessions given to the students. These sessions were aimed to help the students with understanding and – more importantly – to give them the necessary practical skills to build the free space optical telecommunication link (see further).

The students were divided in three groups. One group studied the receiving part of the link, including an analysis of the photodiode's characteristics and detection circuits. Another group investigated the steady-state properties of the laserdiode used in the transmitting part. And the last group tackled the optical setup, including the optical components and the alignment of the fiber-optic components. State of the art equipment from our research labs was available to the students to carry out these experiments. After some time, the groups were switched on a round-robin basis.

B. Building the Optical Link

In the second phase, the students had to combine transmitter, receiver and optical parts into a table-top demonstrator sending data over an 3 meter long optical channel. The

students succeeded in sending both music from their mp3-players as well as movies from a camera over these links and converting back everything into useful data. Using their knowledge from the lectures and their experience from the practical sessions, the students finally took up the challenge of building the real optical link, 100m long over the university's campus. The bad weather made their job even more difficult. With an additional WiFi channel as reference for a lock-in amplifier, they managed to align the receiver and transmitter modules and to send radio music over the channel.





C. The Exam

At the end of the course students take an exam to evaluate the participants' newly gained skills. The participating students can get a certificate for the Summer Course by BEST; it is up to their home university to decide if ECTS credits are issued for this certificate. Due to the high importance of practical skills in this Summer School (there were more hands-on sessions than lectures), we decided that a traditional exam was not a proper means of evaluation, and that an individual presentation was a more appropriate way of assessment.

All students received five minutes to explain one of the experiments they had conducted during the preparation of the optical link to their colleagues. They had one afternoon to prepare this presentation. The presentations were evaluated by two members of the Chapter, Sara Van Overmeire and Philippe Tassin. The level of the presentations was rather high, resulting in certificates being issued to all but one of the students.

NEMO'S EDUKIT AS A TOOL FOR OUTREACH ACTIVITIES

1. NEMO AND ITS EDUCATIONAL KIT

NEMO is the "Network of Excellence in Micro-Optics" constructed under the European "Sixth Framework Programme". It aims at providing Europe with a complete Micro-Optics food-chain, by setting up centers for optical modeling and design, measurement and instrumentation, mastering, prototyping and replication, hybrid integration and packaging, reliability and standardization. More than 300 researchers from 30 groups in 12 countries participate in the project.

One of the objectives of NEMO is to spread excellence and disseminate knowledge on micro-optics and micro-photonics. Therefore NEMO plans to inform pupils, already from secondary school level onwards, about the crucial role of light and micro-optics and the opportunities this combination holds. This will be done through the distribution of a user-friendly and well illustrated educational kit (Edukit) to their physics/technology teachers. The latter contains a variety of replicated micro-optical refractive and diffractive components, fabricated with the aid of the network technology centers, a semiconductor laser source and a clear and instructive manual for basic experiments. NEMO's Edukit is self-consistent: schools with no optical instrumentation will be able to use it for basic demonstration. However it should also be possible to use the elements in more complicated set-ups to be constructed by the users themselves. Due to the Edukit's large potential for stimulating youngsters' interest in the field of micro-optics, this project has also received the support of SPIE Europe.

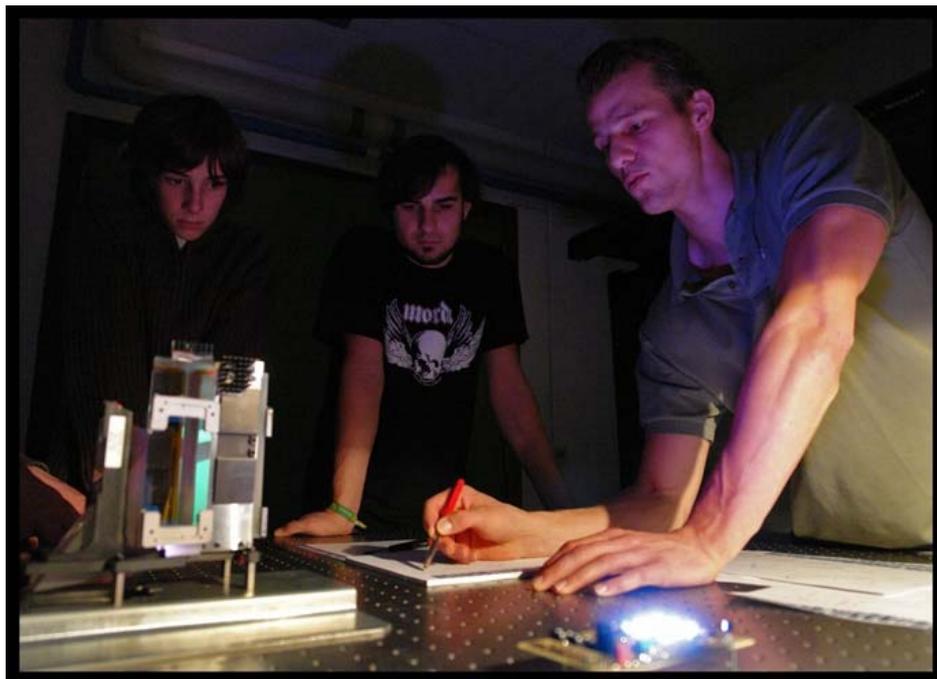
2. INVOLVEMENT OF THE SPIE STUDENT CHAPTER FOR OUTREACH ACTIVITIES

The SPIE Brussels student chapter has engaged itself to help promoting NEMO's Edukit amongst teachers, students and all other interested parties. This year, we have contributed to three promotion events. At the Photonics Europe 2006 conference in the beginning of April, we participated in the demonstration of NEMO's Edukit at the NEMO booth that was set up at the Photonics Innovation Village. Several tens of interested conference attendees came by to learn more about the basic concept and the purpose of the Edukit. On July 6 we assisted to an informative session about NEMO's Edukit at the European Commission in Brussels. The audience consisted of about 10 interested functionaries of the European Commission – some of them also brought their children – for whom we demonstrated the use and the potentialities of the Edukit. On October 4 we participated in a workshop about the Edukit for physics teachers of several high schools in Belgium. A group of about 10 teachers gathered at our university (Vrije Universiteit Brussel) to attend this interactive workshop. They received information not only about the NEMO network and the Edukit, but also about SPIE and the participation of the SPIE Brussels student chapter in activities meant for stimulating youngsters' interest in the field of micro-optics. The teachers also had the opportunity to experiment with the Edukit and were given information on how they could integrate experiments with the Edukit into their lectures at high school. Below you can find some pictures that were taken at this informative session for high school teachers.



SCIENCE WEEK FOR HIGH-SCHOOL STUDENTS

The student chapter organized a workshop on color perception and color measurements. Two times fifth year high school students (age: 16) attended the workshop. After a 50 min. introduction on light, wavelength, the solar spectrum, color absorption and reflection, the students were divided into small groups to begin the hands-on lab sessions.



All students handled four experiments:

- Measuring the spectrum of a tunable RGB LED module and finding color coordinates
- Measuring the spectrum and luminous flux of various white and colored light sources, finding the color coordinates and the color temperature
- Splitting white light of an incandescent lamp and the LED module with a prism
- Exploring of the properties of color sensitive coatings

ACCESS TO THE SPIE DL (DIGITAL LIBRARY)

For a PhD student, it is very important to be up to date in his/her research topics. The SPIE Digital Library offers a large collection of optics and photonics content. Therefore, we have decided to devote part of our budget to provide access to the SPIE Digital Library to the members of our SPIE student chapter.

We proceeded as follows: The members of the student chapter have access to the SPIE Digital Library through the personal subscription of two of the officers. This means that the initial amount is 100 papers for one year. Since our Chapter has a little more than 20 members, the target is five papers per student but this number could be increased if necessary in the near future.

For a request, the students should send an email to the SPIE officers with the complete reference of the paper. A thorough list of the already downloaded papers is kept to avoid duplicate downloads.

Until now we have observed that the access to the library has been very well welcomed. The students are doing a wise and selective use of it. We will keep monitoring its use for evaluation later on.

GENERAL MEETING AND RECEPTION

On November 23rd, 2006, we held an official general meeting, followed by a reception. The officers of the Student Chapters communicated the most important issues to the Chapter members and we offered the Chapter members some food and drinks to celebrate the well functioning of the Chapter. The reception was followed by a karaoke session, which unveiled the singing talent of some of our members ;-)

II. OVERVIEW OF PLANNED ACTIVITIES

Of course, some of the activities described above in our activity report are ongoing activities, which we will continue in the future. Especially the outreach activity using the NEMO Edukit. We have now established an "Edukit working group" within our chapter, which means that we have appointed a group of students actively involved in this outreach activity. We also plan to take it to another level, where we are no longer restricting ourselves to outreach in Belgium, but in whole Europe. This will happen through the travelling exhibition "Fascination of Light" coordinated by VDI (the German Engineering Association), which will be organized in different cities throughout Europe (<http://www.faszinationlicht.de/scripts/php/index.php>).

Another point on our agenda, is a collaboration with the SPIE Student Chapter of the Warsaw University of Technology in Poland. We have already been extensively exchanging e-mails and an internet meeting is planned for later this month, to find common research interests.

Regarding conferences, two of our members will attend the SPIE Photonics West 2007 conference in San Jose at the beginning of next year and we will probably also have a number of students going to the SPIE International Congress on Optics & Optoelectronics conference in Prague in April.

III. FINANCIAL STATEMENT

Our Brussels Student Chapter was established in April 2006 and our first activity grant was received on 11/07/2006.

SPIE Activity grant	\$890.76
Access to the SPIE Digital Library	
Personal Subscription Nathalie Vermeulen	-\$85.00
Personal Subscription Virginia Gomez	-\$85.00
Reception after the general meeting of 23/11/2006	-\$81.88
Student Chapter financial account cost	-\$11.00 (8.34EUR)
BEST Summer School	-\$200
Science Week	-\$100
Balance	\$327.88

It should be mentioned that our Chapter advisor, Prof. Hugo Thienpont, has matched the expenses for a large part of our activities (e.g. BEST Summer School, Science Week,...) and provided full financial support for some others (e.g. Photonics Europe 2006, NEMO's Edukit outreach,...).

Our president, Jürgen Van Erps, received an SPIE Officer Travel Grant to represent our Chapter at the Student Leadership Meeting at the SPIE Optics & Photonics conference in San Diego, CA. The picture below shows Jürgen (middle) and his "Old Oak Tree" teammates Ivan, Vladimir, François and Shaoying during the outreach rodeo.



IV. MEMBER LISTING

Our current list of members looks as follows:

1. Mr. Jürgen Van Erps, President
2. Miss Nathalie Vermeulen, Vice-President
3. Miss Virginia Gomez, Treasurer
4. Mr. Philippe Tassin, Secretary
5. Mr. Maciej Antkowiak
6. Mr. Mikel Arizaleta
7. Mr. Iñigo Artundo
8. Mr. Thomas Berkvens
9. Mr. Martijn Beukema
10. Mr. Lawrence Bogaert
11. Mr. Miguel Cornelles Soriano
12. Mr. Lieven Desmet
13. Mr. Ignace Gatara
14. Mr. Thomas Geernaert
15. Mr. Lendert Gelens
16. Mr. Yuzo Ishii
17. Miss Els Moens
18. Miss Christine Ruwisch
19. Mr. Frank Tavernier
20. Mr. Peter Toet
21. Miss Elke Van Den Brandt
22. Mr. Bart Van Giel
23. Miss Sara Van Overmeire
24. Mr. Michael Vervaeke