Bringing together graduate students and companies to solve industry-related problems in optics and photonics

Philippe Guay[1,2,*], Olivier-Michel Tardif[1,3,*], and Lauris Talbot[1,3]

[1]Centre d'optique, photonique et laser, Université Laval, Québec, QC, G1V 0A6, Canada
[2]Département de génie électrique et de génie informatique, Université Laval, Québec, QC, G1V 0A6, Canada
[3] Département de physique, de génie physique et d'optique, Université Laval, Québec, QC G1V 0A6 Canada

ABSTRACT

For the last fifteen years, Université Laval's SPIE Student Chapter has been building strong links between academia and industry to better prepare its student members to face their future career and to guide them towards industry. With now over fifty companies working in the field of optics and photonics in the Quebec City area alone, this makes it one of the best places in the world for students to visit companies and learn about companies' expertise, equipment and work environments. In 2017 and for the first time at Université Laval, the Student Chapter organized a day-long workshop where students had to solve real-world industry-related problems presented by high-end optics-related companies, i.e. an industrial seminar. Now at its fourth edition, a retrospective picture investigating the success of this event can be drawn. Over the years, more than 20 companies from Quebec City's rich optics and photonics area were invited to present their domain of expertise to students through conferences, product demonstrations and original problem scenarios encountered in the past. As a result, no fewer than 100 students were familiarized with the work of these technology companies. They also exchanged and shared ideas with expert engineers, physicists, chemists, etc., and were given real-world problems to solve. From this process, direct links were created between the employers and the future employees, and a clearer picture was drawn for graduates envisioning an industrial career. Consequently, this event has shown to be beneficial for both students and companies.

Keywords: Science Outreach, Education and Training in Optics and Photonics, Student Chapter, Student Initiative

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1. INTRODUCTION

The Université Laval's SPIE student chapter (REPOL, *Regroupement des Étudiants en Photonique et Optique de Laval*) was founded in 2005 by R. A. Lessard as a way to promote light-related sciences to the public and to prepare its members for their future career. Nowadays, it represents annually forty to fifty graduate students conducting research in optics and photonics at the Center for Optics, Photonics and Laser (COPL) in Quebec City. Throughout the years, the Chapter has organized several outreach events for high school and cégep (college) students and for the public which have proven to be huge successes. The most popular events, namely The Optical Terrasse (*La Terrasse optique*),[1] The Photonics Games (*Les Jeux Photoniques*),[2] A Meeting with Light (*Une Rencontre avec la Lumière*),[3] and REPOL's educational demonstration laboratory,[4] have reached nearly 20,000 people in total thus far.

The Chapter has always sought to find new ways to teach optics-related phenomena to youth and adults in order to spark their interest for the science of light. However, for years, the only strategy it used to help its members with finding their ideal job was through the organization of visits to companies' workplaces. Following the first initiative of such an activity in 2009, the number of members registered to the student chapter went up by

Further author information, send correspondence to olivier-michel.tardif.1@ulaval.ca
*These authors contributed equally to this work

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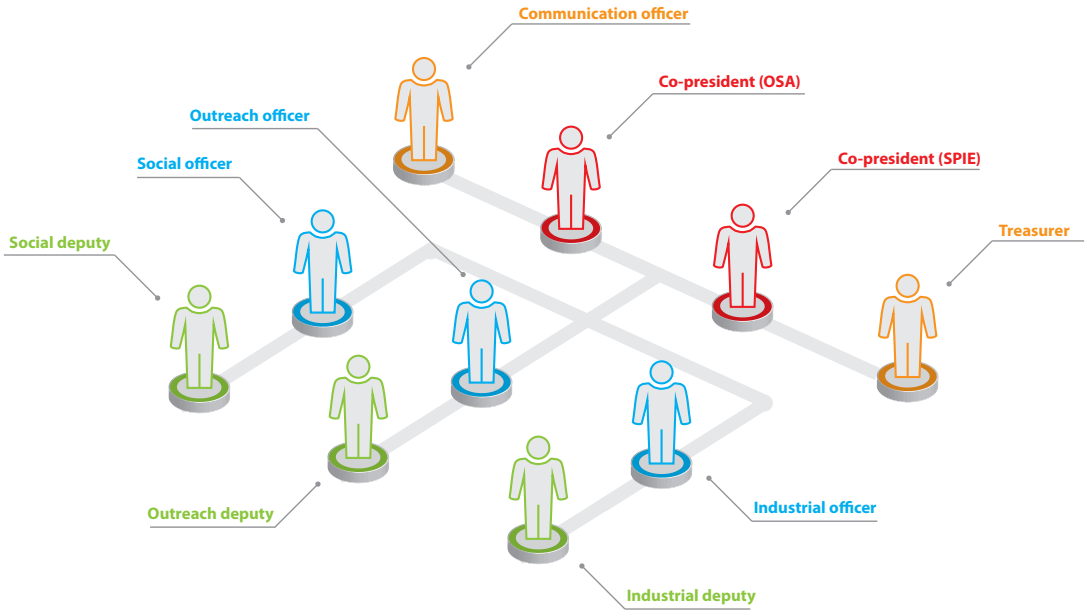

Figure 1. Executive positions of the REPOL

a factor of two, confirming the great interest students have in participating to these professional activities. Since then, the Chapter has organised many industrial visits and is maintaining more than 40 registered members every year. However, the Chapter was still not fully taking advantage of Quebec City's dynamic industrial ecosystem. Over the last decade, the city has indeed become an innovative hub in optics and photonics (O&P) with more than fifty companies working in related fields.[5] Currently, the Quebec City O&P industry generates over 8300 jobs and CA$1.5B in total revenue.[6] It counts 19 research and development centers focused on O&P, making it one of the best cities for O&P professional development.

To benefit from this rich environment, the Chapter set up for the first time in 2013 an industrial round-table event where members could ask questions to scientists and engineers working in companies to get a sense of what a industry job is like. As the event was very well-received, it led to the organization of the first industrial seminar in 2017 where companies were invited to either present themselves, present an industrial problematic they have faced that is of interest to O&P students or present their products. Since the 2017 event turned out to be a huge success, it has been repeated every year since.

This paper aims to describe all aspects in the preparation of the industrial seminar in hopes that it can help and guide other chapters interested in reproducing this kind of event. First of all, a brief description of the Chapter's organization is given. Then, the activities proposed during the industrial seminar are described as well as the financing of the event. Finally, the impact of the event is discussed.

2. THE CHAPTER

The REPOL is a joint student chapter of The Optical Society (OSA) and The international society for optics and photonics (SPIE). During the year 2019-2020, 50 students who are members of the OSA and SPIE were active within the REPOL, taking part in various activities. Of those 50 members, ten served on the executive committee. Although the REPOL has encouraged its members to join one or both of these international organizations ever since its creation, all students of the COPL are welcomed to join its social, professional and educational activities. This approach contributes to its mission to ensure that as many students as possible enjoy their graduate school experience, introducing them to the vibrant community of young researchers, to companies' recruitment teams and future employers.

Figure 1 shows the structure of the executive committee. Instead of using a completely hierarchical structure, the REPOL is made up of small committees or teams working on given projects and reporting their progress to the

chapter co-presidents during every monthly meeting. This structure, based on a project management approach, has proven to be effective in the realization and the development of small and large-scale projects throughout the Chapter's history. Explicitly, two co-presidents lead the REPOL and ensure good communications between the REPOL and both the OSA and SPIE organizations. Moreover, one communication officer and one treasurer constitute the administrative committee. The former handles the website, the social media page and the email address so as to ensure that all members are aware of the positions taken by their Chapter as well as to promote the many events organized every month. The latter deals with all financial matters, namely the grants received from OSA and SPIE and event outcomes, e.g. oral communication prizes, food, experiment materials, etc. Three other committees (social, outreach and industrial) organize and manage the various activities of the Chapter. The first one's mission is to create a strong community where young researchers can exchange, interact and learn about each other's interests during gatherings taking place at local restaurants and pubs, whether it be around holidays or during any of the monthly events. These events are especially important to properly welcome REPOL's newest members. The second committee's mission is to promote the science of light to kids, underrepresented groups in science, technology, engineering, and mathematics (STEM), and the people living in the Quebec City area. To this end, the REPOL created a demonstration laboratory, or Demo Lab, within the COPL facilities which allows everyone to witness several phenomena related to optics, photonics and communication science. Such laboratory has proven to be a strong asset and plays an important role in promoting light science phenomena as it is often one of the activities most beloved by high school students after visiting the COPL research center. Finally, the professional committee's mission is to establish a strong and lasting link between the REPOL and companies. Hence, the Chapter organizes visits to local companies as well as seminars to bring industry and academia together. All student members are welcome to join and take part in these visits and seminars. This approach is valued by students and it allows them to learn more about jobs in industry and talk to high-tech employers. All of these three committees are managed by 2 people : an officer and a deputy. While both work together, the deputy is often the role chosen by new members to contribute to the development of the student Chapter.

2.1 Keeping the community informed

Throughout its history, the REPOL has devoted a lot of its resources to popularizing science to youth and the general public. Many initiatives such as The Optical Terrasse,[1] The Photonics Games,[2] A Meeting with Light[3] and more stand as examples. The Optical Terrasse is a stand-alone mobile structure which can be placed in various neighborhoods of a city and where people can interact with parts of the structure and learn at the same time about optics and photonics phenomena in a museum-like experience. The Photonics Games are an event for grade 11 students enrolled in the science curriculum at their school. It aims at making STEM fun and inclusive

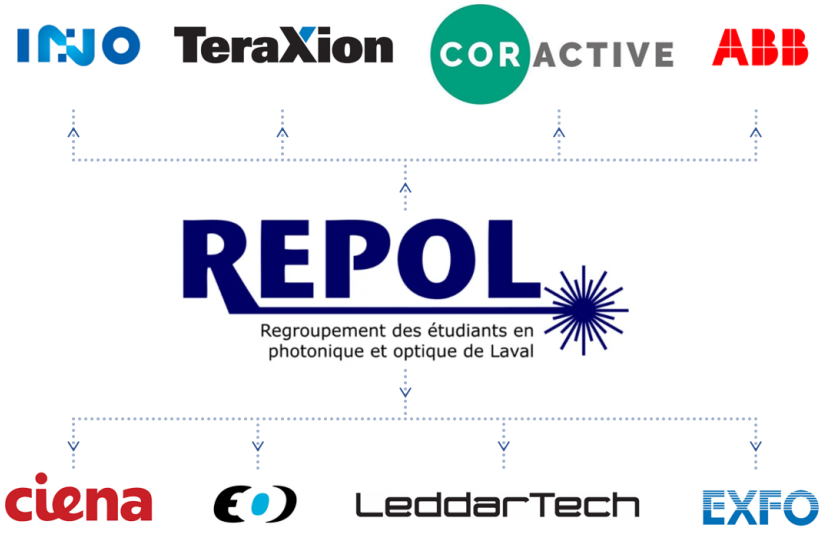

Figure 2. List of the companies that have been visited in the past 5 years by REPOL

through multiple games during a one-day event. Finally, A Meeting with Light consists of stand-alone booths which can be installed in indoor public places like libraries or convention centers. People can read about the underlying science of many technologies like lasers and optical fibers as well as manipulate these devices safely.

2.2 Adding value to members' training

It is worth mentioning that the REPOL also stands out in regards to the professional development activities that it offers to its members. Each year, the chapter organizes visits at several companies and research centers based in Quebec City. Typically, 40% of all members take part in each of these activities. Since research conducted at the COPL ranges from electrical engineering and chemistry to physics and biophotonics, the REPOL industrial committee makes sure that various companies are visited throughout the year in order to meet the needs of all members. A brief overview of the institutions that were visited in the past 5 years are summarized in figure 2. Their respective domains of expertise cover the broad spectrum of specialization offered at the COPL, e.g. telecommunications (Exfo, Ciena), optical fibers and laser development (CorActive), photonic components (Teraxion), Lidars (Leddartech), laser power meters (Gentec-EO) and spectrometers (ABB) among many others.

There is no strict plan on how a visit should be held. However, it usually starts by a tour of the facilities given by employees to the participants. Various professionals like engineers, scientists or even directors join this tour so as to offer the better and most realistic experience to students. Afterward, a period of questions opens and members of the REPOL can interact with and get answers from all employees who are part of the activity. This moment is the perfect occasion for these young scientists and engineers to network with industry people and, therefore, to get a glimpse of what it is like to work in such an industrial environment. These activities are of great importance to any chapter seeking improvements regarding the professional training of their members. Indeed, they help reinforce ties between the chapter and the O&P industry, and are an efficient way to truly prepare students to their future career and job search.

Figure 3. Photos compilation of various editions of the industrial seminars showing conference sessions as well as problem-solving situations

3. THE INDUSTRIAL SEMINAR

For years, the REPOL has visited O&P companies in the Quebec City area. By continuously visiting new companies and keeping strong relations with regular ones, the REPOL was able to build a long list of companies willing to take part in an industrial seminar. In 2017, the REPOL organized its first activity of this kind whose goal was to expose real-life O&P problems that companies face every day to graduate students. This activity has been held every year since. The REPOL's ability to diversify the invited companies gives students the opportunity to network with new companies and face new challenges at every edition, even if they participated in previous editions. During the 2017, 2018 and 2019 editions, the REPOL received companies ranging from university spin-offs to large international ones as well as research center delegates and patent agents.

3.1 Activities

The industrial seminar consists of day-long workshops divided into conferences, real-world interactive problem-solving sessions and product showcases. During conferences, companies are invited to give a 25 minute talk to introduce themselves to students and young scientists as well as to present their products and their everyday tasks. The speaker is also required to talk about his own experience as an employee and the relevant qualifications sought in future candidates. A period of questions usually follows the presentation.

During the real-world interactive problem-solving sessions, companies share to the attendees issues and challenges they are currently facing or have recently faced and solved. After being introduced to these challenges, students are divided into small teams to discuss about how they would approach such problems and to find the optimal way to fix them. Thereafter, every team shares their idea with one another during meeting-like discussions. Finally, the presenter reveals the strategy used by the company to solve the issue. If it has not yet been solved, the best solution that the company has come up with is presented. Interesting discussion results from this process.

This day-long activity closes with companies showcasing their most recent products. The REPOL makes booths available for companies to install their setup. This exhibition is a great way for students to see prototypes and devices that arise from companies' R&D meetings. Being limited by the one-day length of this event, there is only time to host two conferences and a problem-solving session before lunch. During the afternoon, another conference, a second problem-solving session and the company exhibition are held.

3.2 Financing

Organizing industrial seminars is a great way for chapters to enrich the professional training of their members while not decreasing their number of regular events due to their limited annual budget, as all editions held by the REPOL were self-financed. All companies involved support this event financially with amounts depending on which activity they will be involved in. The costs are divided according to three categories : problem-solving session, conferences and product exhibition. The REPOL decided to include the product exhibition to the first two categories as a package deal. The money collected from companies was used to pay for all event supplies and more, as delineated by Table 1 for the 2019 edition.

Table 1. Expenses generated from hosting the industrial seminar by category for the 2019 edition

	Drinks and Food	**Supplies**	**Total**
Costs [CA$]	1349.00	136.00	1485.00

4. IMPACT

Although measuring the impact of an activity is often quite subjective, the REPOL managed to quantify the reach of the industrial seminars. Considering that this activity is designed for graduate students, thus is not built for the general public, the number of impacted people is expected to represent a fair amount of the number of young scientist studying at the COPL. Since 2017, the seminars have welcomed approximately 40 students each year, for a total number of attendees of 120 students over three editions. However, this analysis doesn't take into account the fact that a same member could have attended to multiple seminars. Nevertheless, given that

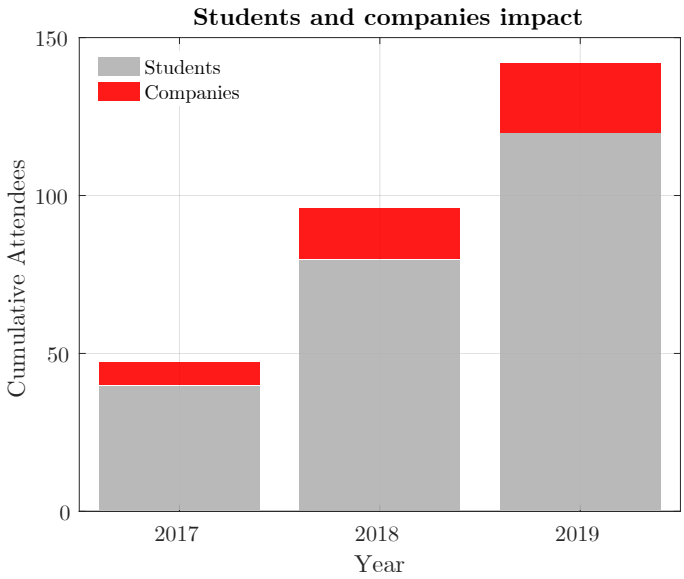

Figure 4. Cumulative attendance for both the students and the companies showing growing impact

the REPOL has counted about 50 members each year since 2017, the percentage of attendance can be estimated to 80% of the total number of registered members and is found to be stable.

The impact that seminars has on graduate students' professional training is quite important, but the impact it has on the companies must not be neglected. In 2017, 2018 and 2019, respectively 7, 9 and 6 companies participated in the seminar. Thus, a total of 22 companies have had the opportunity to reach out to students, connect with future employees and recruit interns. The cumulative attendance of companies and student members is shown in figure 4 for all editions of the industrial seminar held so far.

5. CONCLUSION

In conclusion, industrial seminars are great events to build strong and lasting ties between a student chapter and its surrounding companies working in the O&P industry. The three editions organized by the REPOL have proven to be beneficial for both the student members seeking professional training and job insight, and companies seeking to hire new employees or answer the frequent interrogations of graduate students as they approach the job market. Over these editions, students have shown great appreciation for the event. This appreciation motivates the REPOL to continue to offer this seminar and to constantly improve it. Due to the crisis caused by the novel coronavirus (COVID-19) forcing minimal social interaction, the 2020 edition of the seminar had to be cancelled. However, the REPOL is currently working towards moving the event to an all-digital format which will take place later this fall, as this is part of its mission to create a strong and healthy relationship between industry and academia in Quebec City.

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