

Contributions to the Jubilee Symposium of the Photonics Society of Poland for its 15th anniversary by Optica

Claus Roll,¹ and Ulrike Woggon²

¹ *Optica, 2010 Massachusetts Ave. NW, Washington, DC 20036 USA*

² *Institute of Optics and Atomic Physics, Technical University of Berlin, ER 1-1, Hardenbergstr. 36 A, 10623 Berlin, Germany*

Received June 27, 2023; accepted June 27, 2023; published July 2, 2023

Abstract—In this article, we summarize our presentations as two representatives from Optica (formerly OSA) at the ceremony celebrating the 15th anniversary of the Photonics Society of Poland. The first presentation provides an update of the dynamic industrial revolution occurring in light science and technologies. In the second presentation, recent activities of Optica in Europe are shown.

It was a great honor for Optica to be invited to the event celebrating the 15th anniversary of the Photonics Society of Poland (PSP). Optica is a longstanding collaborator with PSP and we look forward to continued partnership (Fig. 1).



Fig. 1. Ulrike Woggon, presenting the proud partnership between Optica and the Photonics Society of Poland.

The organizers were so kind as to ask Optica to provide a presentation about the current industrial revolution occurring in light science and technologies as well as to present its recent activities in Europe. Founded in 1916, Optica is one of the leading organizations for scientists, engineers, business professionals, students, and others interested in the science of light.

Ulrike Woggon, as a member of the Optica Board of Directors, gave an overview of the impact of optics and

photonics on the evolution of the global industry. As diverse and dynamic as ever, the optics and photonics industry continues to exhibit impressive growth, with an estimated overall compound annual growth rate of 7.1% from 2020 to 2025.

Optics and photonics are key enabling technologies that play a crucial role in many industries, including telecommunications, healthcare, manufacturing, and entertainment. The global economy relies heavily on these industries, and as such, the optics and photonics industry makes a significant contribution to the global economy.

The sectors relying on technology from optics and photonics comprise displays, communications, life sciences, industrial tools, lighting, consumer, security, and energy (Fig. 2). Many familiar global corporations appear up and down the optics and photonics supply chain as materials and components manufacturers, systems integrators and end users and some even serve in multiple roles.

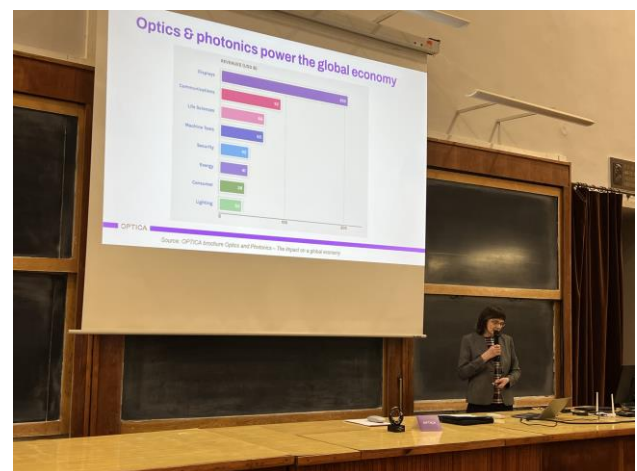


Fig. 2. Part of the presentation showing the size of the different sectors by revenue.

Optica estimates that small- and mid-size companies comprise over 90% of the total number of companies in optics and photonics. These companies are sources of innovation, offer custom or specialized products and services, and serve niche markets that large companies choose not to serve.

In the following paragraphs, some examples are presented to illustrate the global impact of optics and photonics.

Health care: the involvement of optics and photonics in resolving major global issues, optics proved essential for the identification of COVID and its variants and the rapid development of a vaccine. This was thanks to gene sequencing equipment that became relatively inexpensive only recently. If SARS-CoV-2 had spread just a decade or two earlier, it would have been far more devastating, with little to identify and remedy the disease.

Lasers: One of the major applications of lasers is for machine tools, particularly metal cutting. This is now a highly sophisticated and automated technology. Another example is the introduction of blue laser diodes in additive manufacturing and the use of blue laser diodes for free-space communication, leading to sizable demand in the market.

Extreme ultraviolet (EUV) in lithography: The world runs on electronics, and electronics are manufactured with microlithography equipment. All semiconductor lithography uses optics, particularly in the ultraviolet, and uses phenomenal technology to correct for distortions across wafers as large as 300mm (about 12 inches).

Optical communications: Our cloud services, search engines, and social media all require data centers. These data centers require hundreds of thousands of optical interconnects. These optical interconnects are reaching further into the racks of servers to the boards stacked inside them. The next step could be to reach all the way to the modules containing the switch chips, a development called “co-packaged optics” (CPO)—meaning the optics and electronics would be packaged together, a first for the industry. Likewise, optical fiber links are reaching to homes and apartments. New 5G wireless networks promise to require even more fiber links to wireless antennas located closer to users.

Photonic Quantum Technology: This field has seen major advancements in computing, communications, and sensing — areas that rely heavily on optics and photonics. Many quantum computing prototype devices are based on integrated photonics. Public and private sectors are making significant investments in these architectures,

which means big opportunities for the optics and photonics community.

Sensors based on optics and quantum optics:

There are many types of sensors and many more applications for them. Imagine how many optical sensor technologies there are. For example, LIDAR, CCDs, fiber sensors, photoacoustics, gravitational sensors, etc. Now imagine how many ways each could be used in applications: dozens, hundreds? Add those up and there are thousands of applications for optical sensors in important fields such as environmental sensing, augmented and virtual reality, transport, medical applications, imaging, etc.

Photovoltaic energy: It is a success story that developed over decades but became competitive in energy markets only recently. Recent examples show even floating plants of solar panels. They do not need to take usable land, limit evaporation in reservoirs, limit algae growth by providing shade, and provide cooling and gains in efficiency for panels.

LED lighting is another success story that became commercially competitive in recent years. This includes flexible OLED (organic LED) panels as decorative lighting.

“Big Science”: One of the ultimate specialty applications of optics and photonics is the James Webb Space Telescope, Artemis, Advanced LIGO, and other projects. While the market for scientific R&D optics and photonics itself is not large compared to the other major sectors, it is nonetheless significant to the companies that sell into it. Deep science projects such as these also have a special place in our vision for optics and photonics because they address some of the most basic human questions about the nature of the universe and our place in it.

In the second presentation, Claus Roll presented Optica’s new activities in Europe, managed through staff based in Europe.

In addition to the conferences, fairs, and other events that Optica has traditionally organized in Europe, new initiatives have been launched to support closer connections within the European optics and photonics community.

A common point amongst these new and complimentary activities is that they have been initiated via or together with partners in Europe. Some of the motivations of these partners are:

- to reach a global network/audience with their message/content,
- to involve global experts in their events

An example of one such initiative was started during COVID in order to maintain contact with our community.

Working with the EPS Young Minds section, we launched the “From PhD to CEO” event series (Fig. 3). Now in its third year, these sessions help students navigate the transition from university to industry, foster innovation and entrepreneurship, and provide insights into the European start-up culture.

Initially hosted as a webinar, the series is now organized in-persons events during conferences.

Examples of initiatives in Europe

Supporting partner societies, startups, PhD students and young researchers

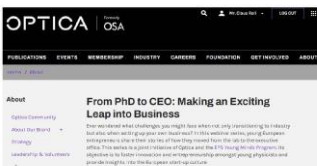


Fig. 3. Description of the “From PhD to CEO” series of events. The photos show an event organized together with the Danish Optical Society.

Further, with partner societies or clusters, we have organized:

- sessions about global topics during conferences or fairs.
- networking events to help bringing the community together
- presenting “Optics and Photonics” as a sector of choice to young persons deciding about their future career options.

We are also connecting with the Optica student chapters to organize special sessions that teach soft skills. An example is workshops about how to write and submit an article (Fig. 4).

Examples of initiatives in Europe

Organizing workshops



Further workshops to come, with additional content

OPTICA

Fig. 4. The slide shows examples of author workshops held with different Optica student chapters in Berlin, Enschede, and Tampere.

This initiative is widely supported by Optica’s many journal Editors, who contribute to these workshops by giving their insights into the writing and publication process.