Seeing Through Skin

Also Inside:

- In Memoriam: Jane M. Simmons, 1963–2021
- Humanitarian & Student-Driven Activities
Think Precise

Next Generation Photonic Testing

Model: TSL-570

New for 2021

Tunable Laser

Delivering a major leap in functionality, speed and performance, Santec’s TSL-570 does not disappoint. 200 nm/s scan speed increases productivity; Ethernet communication and programmable triggers provide complete flexibility. A sealed cavity ensures stability - irrespective of wavelength. Sub-picometer resolution, sub-picometer accuracy. On a bench or integrated into automated test stations, Santec has built on its 40 years experience to create a laser for next generation engineers, for next generation photonics.

www.santec.com

The world’s first and most widely used tunable lasers
December 2021 Volume 35, Number 6

FEATURE
Research Highlights ................................................................. 6
– Seeing Through Skin

Industry Engagement ............................................................... 10
– Life at a Photonics Startup: Lessons Learned

Get to Know Your IEEE Photonics Society Leadership .............. 13

Photonics Worldwide—This Is My Lab ........................................ 16

Book Review: Programmable Integrated Photonics .................. 18

News ..................................................................................... 19
– In Memoriam: Jane M. Simmons, 1963–2021
– Important Changes to the Photonics Society Bylaws

Careers and Awards ................................................................. 21
– Royal Academy of Engineering Inducts IEEE Photonics Society Fellow, Professor Nabeel Agha Riza
– Meet the Newly Elected Members to the Board of Governors
– Photonic Society Call for Nominations

Membership ............................................................................. 24
– Humanitarian & Student-Driven Activities Led by Chapters in Africa and Mitigate Agricultural Disasters
– 2021 Chapter Awards Announcement
– Don’t Be Afraid to Learn
– Special Event Recap: Women-in-Electronics & Photonics Symposium at CSW2021
– IEEE Senior Member Initiative

Conferences ............................................................................. 40
– Conference Report, 27th International Semiconductor Laser Conference (ISLC)
– ETOP Conference Highlights
– Asia Communication and Photonics (ACP) Conference Review
– Save the Date—Summer Topicals 2022
– Save the Date—RAPID 2022
– Save the Date—IEEE Photonics Conference 2022

Publications ............................................................................. 51
– JLT CFP: Integrated Photonics for Quantum Applications
– JSTQE CFP: High Density Integrated Multipurpose Photonic Circuits
– JSTQE CFP: Nonlinear Integrated Photonics
– JSTQE CFP: Optical Computing
Welcome to the final issue of the Newsletter for 2021! I’m writing this on the day after American Thanksgiving, and, in the spirit of reflecting on gratitude, I’m certainly thankful for this inspiring and supportive community. This was a year of many accomplishments in unprecedented times. To me, some of the most impressive feats were achieved by our chapters and conferences, which found new ways to engage the community. I have feeling the incredibly challenging work done by these groups over the past year or two will have an impact for many many years to come.

In this issue, we say a fond farewell to President Carmen Menoni. Prof. Menoni was faced with the challenge of the pandemic at the very start of her tenure as president, and she handled it deftly. She, along with the Board of Governors, the Photonics Society staff, the Councils and Committees, and many volunteers and members, took this incredibly negative state of the world and found new opportunities for growth. We at the Newsletter would like to thank Prof. Menoni for her leadership, and we look forward to her continuing support and guidance in her role as Past President.

The research highlight in this edition, written by Dr. Akhil Kallepalli and colleagues, describes experimental and theoretical methods for evaluating the optical properties of living models of human skin. Human skin equivalents (HSEs), as they’re called, are useful in the medical field for surgical and wound healing procedures. However, for the best results, HSEs must behave optically like true human skin. Dr. Kallepalli and his collaborators describe how they’re applying optical simulation and metrology methods to ensure HSEs will have the right properties to precisely mimic skin.

Finally, as always we have highlighted many of the recent events and accomplishments within the Society. Several conferences were recently held, so please check out the highlights from ISLC, ETOP, and ACP. Additionally, we congratulate many of our members and chapters for their accomplishments, including the recipients of this year’s chapter awards and the newly elected members of the Board of Governors. And be sure to check out the events held by and profiles of our outstanding members and leaders.

In closing, thank you for reading the Newsletter, and please get in touch with us (ipsnewsletter@ieee.org). It’s been a great pleasure serving as the Editor-in-Chief this past year, and we’ve got exciting plans for 2022… stay tuned! Until then, have a safe and happy end of 2021!
JOIN

the world’s best accelerator for optics-, photonics-, and imaging-enabled technology.

If your startup has an industry-changing innovation, Luminate can help. Since 2018, we’ve invested more than $12M in 40+ emerging companies and helped our alumni raise an additional $32M+.

Apply by January 10, 2022
luminate.org/apply
As the end of 2021 approaches, so does my term as President of the IEEE Photonics Society. I would like to thank the Photonics community for the opportunity to have served as your President for the last two years. It has been an honor to contribute to advance the efforts of the IEEE Photonics Society in supporting its members through conferences, membership development, and publications.

The priorities and activities in my role as President had to be redefined, as two months into the position in 2020, all activities turned virtual. Thus, I have missed the opportunity to meet and interact with the Photonics community at conferences or through chapter visits. At the same time, there were many challenges that had to be addressed. The inability to travel set precedence in devising new strategies on how conferences would continue. Starting in May 2020 and until today, the Photonics Society conferences have been virtual. I am sure you are of the same opinion as me, that an in-person conference is not a comparison to a virtual conference, in the same way that listening to a symphony at a concert hall has no comparison to the best sound system. Conferences are the venues for interaction, discussion, where one gets new ideas, and makes one’s work known. Conferences offer the possibility for students and young professionals to be exposed to a broad range of topics in Photonics, to interact with the authors of papers they read, to present their work, and be recognized for their contributions. Conferences are the venue where we recognize the technical contributions and advancements of the community.

I would like to acknowledge the dedication of the organizing committees of IEEE Summer Topicals, IEEE RAPID and the IEEE Photonics Conference, as well as the steering committees of the Conference of Lasers and Electro-Optics (CLEO) and Optical Fiber Conference (OFC), who over the last two years have worked diligently to organize and deliver the high-quality virtual conferences. I would also like to acknowledge Prof. Perry Shum, Vice President for Conferences, the members of Conference Council, and of the IEEE Photonics Conference Steering Committee for their leadership in identifying new opportunities to engage participants and streamline efforts throughout this temporary transition to a virtual platform. Conference staff, Alicia Zupeck and Cheryl Scott, have been instrumental in supporting conferences in every aspect.

My focus over the last two years has been in increasing the visibility of the Society’s products, with emphasis on publications. Towards this goal, supported by staff members Kristen Mahan and Kerrianne Sullivan, we started active marketing campaigns, intensified outreach through social network platforms and began constructing a new Society website. In turn, there is an active campaign in place to promote the visibility of journal articles and new analytical processes that enable the Society to track the success or not of promotions.

Emphasis has been placed on the IEEE Photonics Journal, which is the lead open access platform for the IEEE Photonics Society. Editor-in-Chief, Prof. Gabriella Cincotti, has been instrumental in broadening the technical content of the Journal by expanding the editorial board and increasing the journal’s visibility. Towards making IEEE Photonics Journal compliant with the requirements of Plan S, the Board of Governors recently approved a financial model, which eliminates additional page charges and offers a highly competitive, reduced publication rate for IEEE Societies’ members. Marketing efforts are also being implemented with the other hybrid journals of the Society, emphasizing special topic issues, and issues linked to conferences. A fluent interaction among the editors-in-chief and conferences’ organizing committees is key to the success of this enterprise. My thanks go to the Vice President for Publication, Prof. Seb Savory, to the Publication Council members, and to the editors-in-chief who are leading publication efforts. This group is supported by the Publication Staff, Yvette Charles, Doug Hargis, Sylvia
Hinkson, and Chin Tan Lutz, who are well experienced and extremely dedicated.

In parallel, we continued to streamline the society’s conference portfolio trying to consolidate small conferences into the IEEE Photonics Conference. In this way, it will be possible to capture in a ‘Photonics Week’ event the broad areas of interest to the Photonics community. At a time in which travel has become a serious consideration, on one side due to Covid restrictions and on the other due to environmental concerns, consolidating conferences is critical. I hope this message resonates with you because the success of such efforts relies on the support of the Photonics community.

Another one of my goals was to increase our diversity and outreach efforts. In these areas there have been impressive progress, such as funding over 18 major IEEE Women in Photonics programs and a comprehensive “Iluminando El Futuro” project in Latin America (Region 9). The virtual environment provided a fruitful venue to increase interaction with members of the community worldwide, and in particular students members through an eMentor Match program. In 2021 alone, the abundant activities led by chapters reached ~18,000 participants in 22 countries.

Membership is led by the Vice President for Membership, Dr. Fatima Gunning, who is supported by the Membership Council, and the Education, Diversity Oversight and Globalization committees. As reported by MGA, significant membership growth in 2021 helped put IEEE on the path to recovery from 2020 pandemic losses and organization-wide retention rates are at the highest level in five years. The IEEE Photonics Society contributed with a YoY membership growth of 16.6%—one of the highest growth rates amongst IEEE Societies. Other efforts coming out of membership in 2021 include a podcast series and the transitioning of the Newsletter to an online format with expanded capabilities that you will enjoy. Staff, Lauren Mecum-Smith and Lisa Sandt, are extremely experienced in engagement and tirelessly support our members. Thanks to all for your dedication!

2021 brought some changes in the Society’s organization. The Vice President for Technical Affairs role was redefined into the Vice President for Professional & Technical Development. With this new scope, we strive to provide enhanced support to young professionals through career enhancement and leadership skills growth, and by providing more opportunities to showcase talent and interactions with the community-at-large. Vice President for Professional & Technical Development Prof. Anna Peacock, staff lead Kristen Mahan, and the Council, conformed by chairs from four committees Standards, Industry Engagement, Young Professionals Advisory Professional Advancement and by a task force for Emerging Technologies, have been busy devising new initiatives in 2021 to define the scope and strategic reach. The close interaction with Membership has also been very beneficial to define and streamline such activities. Thanks to all for the great progress in this first year!

The President represents the Board of Governors (BoG), who is the governing branch of the Society. BoG members, including Elected Members selected by you, convene over issues and ideas, in combination with Councils, to delineate where the society needs to devote efforts and resources. It has been a privilege to work alongside such a talented and dedicated group of BoG members throughout these two years. The ability to effectively conduct BoG and Executive Committee meetings in a virtual platform was a learning experience, from the coordination of the meetings across varying time zones to developing ways to ensure that every member had opportunities to let her/his/their opinions be heard. I would like to thank Karen Mergner who throughout these two years supported me in every aspect.

(continued on page 30)
1. Introduction
Human skin equivalents (HSE) are three-dimensional (3D) living models of human skin that replicate the biological properties and interactions within skin. They provide ideal testbeds for many applications such as wound healing assessment, drug assessment [1], [2], etc. and are now seeing application with patients in surgical theatres [3], [4]. For these lab-cultured tissues to be further applicable as mainstream procedures, their mechanical and optical properties must be comparable to in vivo skin. In our lab, we are interested in studying the nexus of tissue engineering and biomedical optics to observe and compare lab synthesis to the real-world analogy. In collaboration with Dr. Junaid (Aston University), we focus on understanding the propagation of light through skin from both a simulation and experimental perspective. If you’re interested in more technical details, analysis and results from a recent study can be found in Kallepalli et al. 2020 [5].

2. Human Skin Equivalents
The human skin is a layered structure of cells at different stages of division. Amongst these layers, primarily, skin is divided into the superficial epidermis and underlying dermis layers. The epidermis is the first line of defense for the human body. The dermis layer serves the function of providing blood and the contained life-supporting oxygen and nutrients for the tissue. This structure begins with live cells at the basal layer (bottom layer of skin). The cells divide and go through their lifecycle as they move to the upper layers before eventually drying and falling off the body. This process is called terminal differentiation. The approach with human skin equivalents is to replicate this process by first generating the bottom layers of the skin before growing the rest of the model. For this purpose, the cells that compose the tissue in vivo are used and are known as primary cells. Fibroblasts that form the basement layers are cultured first, followed by live cells at different stages, as illustrated Figure 1. The keratinocytes form the epidermis, while the fibroblasts form the dermis layers, exactly as in the case of human skin. While the model is composed of live cells, it is important to note that there is a lack of melanin in the epidermis and haemoglobin in the dermis. Melanin is key for protection of skin against sunlight and is directly correlated to the skin color. Haemoglobin is present in the blood, bonds with oxygen and is responsible for transport of oxygen to tissue. Melanin and haemoglobin are the key absorbing entities in the tissue and are referred to as chromophores as they are responsible for the response to interaction with light. To confirm the successful culture of an HSE sample, histological analysis shows the stratified layers of the skin tissue (Figure 2).

3. Light Interaction With Skin
The effect of the human epidermis and dermis on the transmission and interaction with light depends on wavelength and resident chromophores (melanin, haemoglobin). Optically, the tissue is described in terms of its refractive indices and physical thickness. In combination, the optical properties and physical dimensions allow for a detailed simulation.

   All photo-biologic interactions are governed by the wavelength of the incident light, the intensity, and the time of exposure. Our spectral region of interest is limited on one end by
the UV region (due to absorption by the epidermal melaninomes) and on the other end by the NIR radiation (>1020 nm) due to water absorption. Within this window that leaves us the visible and a small portion of the near-infrared wavelengths, most optical approaches to diagnostics are undertaken. Light encounters a mixture of reflection, absorption, scattering and transmission. The amount of light absorbed is governed by the concentration of the constituents of each tissue and the scattering albedo (ratio of absorption to scattering coefficients).

In the epidermis, melanization (and the resulting skin color) is an important factor that affects the propagation of light into deeper layers. For normally incident light, between 4% and 7% of incident light is backscattered as regular reflectance (because the epidermal surface is not smooth and planar) for all skin types. The remaining 93% to 96% interacts with the tissue and results in scattering, transmission and/or absorption to varying degrees. Absorption by melanin is variable because it depends on the concentration, distribution, and thickness of the layers. In the near-infrared region, the backscatter from the epidermis is weak (compared to scattering) and the forward scattering mainly involves off-axis refraction and large-particle scattering [6]. In the turbid dermis layer, the primary chromophore is haemoglobin, and the dominant form of attenuation is scattering. The scattering coefficient is also inversely proportional to the wavelength, and longer wavelengths thus travel deeper into the dermis with less scattering. Greater transmittance of NIR wavelengths through the dermis and arterial blood allows medical diagnostics for measuring the pulse and heart rate and the amount of oxygen present in the blood [7].

4. Monte Carlo Methods
Monte Carlo simulations are the gold standard for modelling interactions between light and biological tissues and testing procedures in biomedical photonics [2], [8]. To achieve convergence to realistic results from stochastic methods, millions of interactions need to be accounted for. For interactions with ≥ 10⁷ photons, ‘brute force’ MC simulations are impractical without variance reduction. This is achieved by importance sampling and ray splitting, which improves the efficiency and accuracy of the MC method. Importance sampling prioritizes the propagation of photons in a specific direction or onto a particular surface of significance. Ray splitting is used to enhance efficiency by splitting every interaction of a photon with an attenuating particle into four components: specular reflectance and transmittance, and scattered reflectance and transmittance. By also modelling absorption, the five components add up to the power of the incident photon.

One of the best-known MC methods for biomedical optics in multi-layered tissues (MCML) [9] calculates the fraction of photon energy lost due to absorption using the absorption albedo (\(\mu_a/\mu_t\)). Scattering events are quantified using polar and azimuthal angles calculated from the Heneyy-Greenstein phase function. The photons are eventually eliminated when reflected or transmitted out of the tissue, or when their power drops below a predefined threshold. The photons are treated as random samples, whereas their absorption, scattering and transmission after interacting with chromophores and particles are physical processes. The optical properties of tissues are defined by the refractive index (\(n\)), absorption coefficient (\(\mu_a\)), scattering coefficient (\(\mu_s\)) and anisotropy (\(g\)). The absorption coefficient and the refractive index define the material behavior, whereas the scattering coefficient and anisotropy influence the bulk scattering of light at a specific wavelength. The refractive index is defined in our study as a complex index (\(n = n_r + ik\)) where \(k = \pi n_m/\lambda_t\). Once the absorbed fraction of the photon’s energy is deducted, the remaining energy is attenuated based on the scattering distribution function (Heneyy-Greenstein phase function, SDF), which is used in MC calculations.

\[
\begin{align*}
SDF &= p(\theta) = \frac{1 - g^2}{4\pi(1 + g^2 - 2g\cos\theta)^2} \\
g &= \langle \cos\theta \rangle \Rightarrow \theta = (g)
\end{align*}
\]

The dimensionless anisotropy (\(g\)) is the average cosine of the scattering angle \(\theta\). It represents the average scattering angle over numerous events [10]. Therefore, the variation in \(g\) dictates the scattering direction, with positive values indicating forward scattering, negative values indicating backscatter and zero for isotropy [11].

5. Analysis of Light Transport Through Human Skin Equivalents
The motivation of our research is to assess the comparability of human skin equivalents with \textit{in vitro} skin. While considering the absence of the chromophores (analogous to tissue that has been removed from the body and prepared by washing with saline solution) and investigating previously published optical properties [12]–[16], we obtained the optical properties most relevant to our study with human skin equivalents. The principle behind this is highlighted by Mignon et al. [17] who cited a large range of optical properties in literature due to the multiple procedures of sample preparation and measurement. The analysis of the HSEs includes MC methods for comparing human skin (with and without chromophores) and experiments that measure the transmission in red and near-infrared wavelengths for comparison with the simulations.

5.1. Simulated Optical Analysis
Simulated optical analysis considers the thickness of the skin layers along with adopted optical properties from the literature. The choice of the properties must be made carefully and specific to each study. The experiments show transmission to a higher degree due to the absence of the attenuating chromophores.

5.2. Transmission Measures
When we ran our experiments, the twelve HSEs were illuminated with a laser beam, operating at red and near-infrared wavelengths (not at the same time). The light that interacts with the skin model and transmits through is measured by a power meter placed behind the sample (Figure 3). Each of the samples was then placed in a custom holder and mounted on a rail, directly in front of the laser source. The thickness of each sample was measured when the optical experiments were complete and were used to set up the simulation models.
compare and validate the thickness variations in the samples, the samples were prepared for haematoxylin and eosin (H&E) staining by washing with saline solution. H&E staining is a standard procedure when preparing samples for imaging under microscopes and gives images commonly associated with microscopy with pink/purple colors highlighting cells.

6. Results and Discussions

When the sample thickness is <0.3 mm, the transmission of NIR rays is unquestionably greater than red-colored light. Additionally, in the simulation and the experiments, we were able to ‘see’ the laser beam as opposed to a scattered speckle-like pattern. This led us to conclude that thin HSE samples (<0.3 mm) behave like filters, such that more light is absorbed than scattered, whereas the opposite applies for thicker samples due to the increased likelihood of interactions. When the thicker skin model was irradiated with red light, 3.2 mW (67%) of the power was absorbed, whereas the thinner models irradiated with NIR light absorbed only 12% of the incident power. The simulation of the thinnest sample forward scattered 55% of the red light and 60% of the NIR light. In contrast to the predictable effects on forward scatter, there was much greater variability in terms of backscatter. In thicker samples, 31% to 34% of the red light was backscattered compared to 38% to 52% of the NIR light. The thinner samples backscattered less than 30% of the incident light at both wavelengths, except for thin samples illuminated with NIR wavelengths. More light was absorbed by the thicker samples. Given optically identical layers (i.e., the same optical properties), forward scattering and the power of transmitted light increased for the thinner samples. The number of rays incident on the detector was also attenuated by the skin model at a given thickness and set of optical properties [13]. Human skin is characteristic in its interaction with light at different wavelengths. A key inference is the deeper propagation of photons into the tissue at longer wavelengths. Our study shows that the trend of transmission at red and near-infrared wavelengths is comparable to in vivo tissue. This finding makes the case for optical similarity of cultured and natural skin tissue and establishes a rapid approach for quality-checking the culture process.

7. Conclusions

Our collaborative research lays the foundation for bringing tissue engineering and optical approaches closer together for diagnostics and standardizing the culture process. Further, we are keen on better understanding the division process of cells within the skin layers and studying the interaction of these cells in response to external stimuli. Wound healing is another avenue that will benefit from access to these HSE cultures as testbeds for understanding the intrinsic and biological processes governing the body’s response. Human skin equivalents are a state-of-the-art addition to any surgical or wound healing procedure. Should the cultures be optically and mechanically identical to human skin, their application...
potential is enormous. While challenges of speed of culture are now being dealt with by additive manufacturing approaches, the access to this cultured tissue could solve major surgical challenges such as those in maxillofacial reconstruction procedures.

8. Authors
Dr. Akhil Kallepalli is currently a research associate at the University of Glasgow, Dr. David James and Prof. Mark Richardson are at Cranfield University, Shrivenham, and Dr. Blake McCall and Dr. Sarah Junaid are at Aston University in Birmingham.

References
Industry Engagement

Life at a Photonics Startup: Lessons Learned
SWOT Analysis—A Powerful Tool for Strategic Thinking

A regular column by Daniel Renner

What Is a SWOT Analysis?
SWOT (Strengths, Weaknesses, Opportunities, Threats) analysis is a strategic planning technique that can provide an organization or a person with significant insight regarding favorable or unfavorable factors (both internal and external) that affect their business or project. It is a tried-and-true tool of strategic analysis that has been used by many types of organizations, such as commercial enterprises, nonprofit organizations, government entities and individuals, to help them evaluate their current strategic position and how to develop in a positive direction. SWOT analysis is also extremely helpful for startup companies as part of their business planning process. It will help define and communicate the business strategy, so that you start off on the right foot and the team knows the direction that it is heading [1], [2].

The acronym SWOT originates from the four parameters that the technique examines:

- **Strengths** are characteristics of the business or project that give it an advantage over others—what separates it from the competition.
- **Weaknesses** are characteristics that place the business or project at a disadvantage relative to others—areas where it needs to improve to be competitive.
- **Opportunities** are elements in the surrounding environment that the business or project could exploit to its advantage—favorable external conditions.
- **Threats** are elements in the surrounding environment that could cause problems for the business or project—negative external conditions.

Strengths and weaknesses are internal factors, current characteristics of the business or project itself. Some examples include team size, funding, patents and intellectual property, engineering acumen and manufacturing skills.

Opportunities and threats are external factors, outside elements that can affect the business or project. Some examples include political and economic factors, climate, competitors, prices of materials, national and international events and changes in the marketplace.

SWOT analysis is usually presented and carried out through a matrix segmented into four quadrants, each one dedicated to a SWOT parameter, as shown in Figure 1.

This practical visual arrangement provides a quick overview of the company’s strategic position. Although not all the points under a particular heading may be of equal importance, they should all represent key insights into the balance of opportunities and threats, strengths and weaknesses.

How Do You Perform a SWOT Analysis?
SWOT analysis is best performed as a group discussion. For a SWOT analysis to be effective, company leaders need to be deeply involved. This isn’t a task that can be delegated to others. But company leadership shouldn’t do the work on their own either. For best results, you need to gather a group of people who have different perspectives on the company, from marketing and product development to manufacturing and sales. Everyone should have a seat at the table. Some companies even look outside of their own internal ranks when they perform a SWOT analysis and get input from customers and suppliers to add their perspectives to the analysis.

If you’re starting a business with just a few people or running a business on your own, you can still do a SWOT analysis. Recruit additional points of view from friends who know a little about your business, your accountant, suppliers, and customers. The key is to have different points of view.

In the discussion, the group should ask itself questions regarding the four SWOT parameters, such as:

**Strengths:**
1) What are the skills of our team?
2) How strong is our vision and strategy?
3) What technologies/products under development are advancing well? (technology-wise and market-wise)
4) What do third parties see as our strengths?
Threats:
1) What do our competitors do well?
2) What market trends threaten business?
3) Are there new competitors?
4) Will suppliers be able to supply the materials we need at the prices we need?
5) What new regulations threaten operations?

Opportunities:
1) What market segments can we explore?
2) What market trends benefit business?
3) What new legislation benefits business?
4) Are there new sources of funding?
5) Are there new potential customers to approach?

Weaknesses:
1) What skills are lacking in our team?
2) What technologies/products under development are not advancing? (technology-wise and market-wise)
3) Where can we improve?
4) What products are underperforming?
5) Are there tangible assets that our company needs?
6) What business processes need improvement?
7) Is our location conducive to success?

The SWOT analysis should start by everyone quietly generating ideas on their own. This prevents groupthink and ensures that all voices are heard. This can be done as individual preparation work before the SWOT group meeting.

At the beginning of the SWOT discussion, all participants should present their thoughts and the meeting leader should list them in each SWOT quadrant, grouping similar ideas together. Additional thoughts will come up at this point as someone else’s idea sparks a new thought in the attendees.

The SWOT matrix is now up for discussion and debate, by examining interactions between internal and external factors. For example, did a new weakness become apparent in the presence of an identified opportunity? These interactions between SWOT parameters should be examined many times, until all ideas have been exhausted. Oftentimes, the initial SWOT analysis changes throughout to reflect factors you were unaware of and would have never captured if it wasn’t for inputs coming from the whole group.

A company can use SWOT analysis for overall business strategy sessions or for a specific segment such as marketing, production, or sales. This way, you can see how the overall strategy developed from the SWOT analysis will filter down to the segments below before committing to it. You can also work in reverse with a segment-specific SWOT analysis that feeds into an overall SWOT analysis.

A SWOT analysis will force you to look at your business in new ways and from new directions. You’ll look at your strengths and weaknesses, and how you can leverage those to take advantage of the opportunities and threats that exist in your market. But remember that business conditions are constantly changing and you’ll want to reassess your strategy, reviewing your SWOT analysis every six to twelve months.

With your SWOT analysis complete, you’re ready to convert it into a real strategy. After all, the exercise is about producing a strategy that you can work on during the next few months.

The first step is to look at your strengths and figure out how you can use those strengths to take advantage of your opportunities. Then, look at how your strengths can combat the threats that are in the market. Use this analysis to produce a list of actions. With your action list in hand, start placing goals (or milestones) on it. What do you want to accomplish in each calendar quarter (or month) moving forward?

Example of SWOT Analysis
To further understand the role that SWOT analysis can play in developing a company’s strategy, we will imagine it being used at Apple, a couple of years after it was founded. As we all know, Apple was founded in 1976 by Steve Jobs and Steve Wozniak, who left college to pursue their passion to develop and commercialize a low-cost computer that we could all have at home. Two years later, by 1978, Apple had about 100 employees and sales of a few tens of millions of dollars. It was still a startup and a small business. What might a SWOT chart have looked like if Steve Jobs, Steve Wozniak and a few other representative members of the Apple team would have talked about it? Knowing what we know of Apple at that stage of its history, which is when the Apple II production volume was starting to ramp up, Figure 2 shows a few elements of their SWOT chart (a practical SWOT chart will typically have more than three elements per quadrant).

This small chart powerfully depicts the strategic position of Apple as a small business poised for growth in 1978. It highlights issues in product development and manufacturing that need to be addressed. The important aspect is to translate the

<table>
<thead>
<tr>
<th>Strengths:</th>
<th>Weaknesses:</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) Strong visionary team, from both technical and business perspectives</td>
<td>1) Relatively small product development experience</td>
</tr>
<tr>
<td>2) Strong and fast R&amp;D</td>
<td>2) No volume manufacturing experience</td>
</tr>
<tr>
<td>3) Product differentiation in performance and technology</td>
<td>3) Small team</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Opportunities:</th>
<th>Threats:</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) New untapped market</td>
<td>1) Competitors pursuing the same market</td>
</tr>
<tr>
<td>2) US and world economy growing fast in late 70’s</td>
<td>2) IBM</td>
</tr>
<tr>
<td>3) Growing “baby boomer” population</td>
<td>3) Supply chain</td>
</tr>
</tbody>
</table>

Figure 2. SWOT analysis matrix for Apple in 1978.
SWOT views into action to correct the issues. This is something that all organizations, large and small can benefit from.

References

About the Column
This is a regular column that explores business aspects of technology-oriented companies and in particular, the demanding business aspects of photonics startups. The column touches on topics such as financing, business plan, product development methodology, program management, hiring and retention, sales methodology and risk management. That is to say, we include all the pains and successes of living the photonics startup life.

This column is written sometimes by me (Daniel Renner) and sometimes by invited participants, so that we can share multiple points of view coming from the full spectrum of individuals that have something to say on this topic. At the same time, this is a conversation with you, the reader. We welcome questions, other opinions and suggestions for specific topics to be addressed in the future. If you have any questions or comments, please contact me at ipsnewsletter@ieee.org.

The expectation is that this column will turn into a useful source of business-related information for those who intend to start, join, improve the operation, fund, acquire or sell a photonics startup. A fascinating area that I have been one of those lucky to enjoy as a way of living for a long time.

A Bit About Me
I (Daniel Renner) grew up in the wilderness of Chilean Patagonia, which is one of the sources of my quest for adventure and for exploring new areas. In my early twenties I went to the University of Cambridge in England to do a Ph.D. in Opto-Electronics, a new area at the time. Now, decades later, I have lived through the whole range of experiences that relate to the development, manufacturing and commercialization of complex photonic devices and systems used in communication, sensor and industrial applications. My experience spans both technical and business aspects of photonic products. This experience has included both large and small companies, which gives me a reasonable vantage point to comment on the ups and downs of life in a photonics startup.

I am currently Chief Business Development Officer at Freedom Photonics in Santa Barbara, CA, and I look forward to our regular conversation through this column!
Get to Know Your IEEE Photonics Society Leadership

Paul Crump
Head of the High-Power Diode Lasers Lab at the Ferdinand-Braun-Institut gGmbH, (Berlin, Germany)
Chair of the Globalization Committee of IEEE Photonics Society

Our volunteer leaders are the driving force behind the IEEE Photonics Society’s mission. This column will spotlight leaders who have made a positive impact on the photonics community around the world. In this issue, Paul Crump, IEEE Photonics Society Globalization Committee Chair, is featured.

What is Your Current Professional Job?
I am the Head of the High-Power Diode Lasers (HPDL) Lab, a topically focused group of device engineers and physicists within the Photonics Research Area of the Ferdinand-Braun-Institut gGmbH, Berlin (FBH). Our group works closely with industry and academia partners to better understand and address limits to power, conversion efficiency, and beam quality in GaAs-based edge-emitting diode lasers. Our goal is to continuously improve diode laser performance to enable progress in the field and realize ever-better performance in commercial systems, from direct low-power medical devices to many kW pumps for large laser facilities. We work closely with FBH’s skilled scientific team to successfully optimize and realize these industrially essential devices and maintain their position as the most powerful, brightest, and efficient light source.

What Role Does Your Volunteer Leadership Position Play for IEEE Photonics Society What Challenges Do You Face?
In terms of roles, first, I am the chair of the IEEE Globalization Committee. Second, I have also supported the IEEE Photonics Society with conference organization for many years and was general chair of the (just completed) 27th International Semiconductor Laser Conference in Potsdam, Germany. We conducted a successful “hybrid” conference, one of the first partially in-person events since the start of the COVID pandemic, thanks to a dedicated and skilled team at the FBH, with a lot of help from our international committee members and the IEEE Photonics Society. This crisis has been an enormous challenge for everyone and made organizing the conference incredibly complex. The large in-person, international participation this year demonstrates the engagement and enthusiasm of the photonics community and their commitment to the conference.

In terms of challenges, as part of the fast-growing photonics area, we confront several unforeseen obstacles like many other IEEE Photonics professionals. Lasers can be used for a diverse range of applications, which is exciting and motivating. Still, it also means that we will inevitably run into capacity limits in terms of our personal and professional commitments, as well as the difficulty of finding talented and motivated collaborators, employees, and research partners.

What Do You Want to Accomplish as a Committee Chair This Year/Next Year?
We are a completely global community but in an ongoing battle to enable the different regions to interact effectively and ensure that many “win-win” collaborations can happen. To help such beneficial interaction to occur, I am targeting six specific tasks as part of my responsibilities as globalization chair:

- Enable effective communication from our existing globalization regions

The world’s most powerful and efficient diode lasers are developed in the HPDL labs at the FBH.
Share the exciting, rapidly progressing technical stories from established, thriving groups.

- Support access and interaction between regions
  - We are not alone: collaboration helps us all. Let’s find ways to make it happen.
- Offer more funding for our global studies:
  - We can’t function as technical professionals without research funding. Where can we find it? This is especially challenging for inter-regional collaboration.
- Add new regions/members to our global team:
  - The world is full of gifted, creative, motivated scientists. Let’s take the photonics field further together.
- Inform each other, making cooperation possible:
  - We can’t collaborate if no one knows we exist. Good communication on our progress is essential.
- Be constructive members of our community:
  - Let’s help our colleagues in the Photonics Society to succeed.

**Why “Photonics”? What was Your “Photonics Moment”?**

After a Ph.D. in device physics, studying details of the fractional quantum hall effect in GaAs quantum wells, it was a significant leap moving into the research on industrial InP-based communication lasers. The pressing need for ever-better lasers among our customers served as a powerful motivator. We delivered something (endless, perfect photons!), and careful physics and materials research studies could pave the way for new and unforeseen possibilities. It was fascinating to see how the scientific approach works as a tool to help people.

**What About Our Society’s Mission and Work Motivates You?**

Based on my interactions with the IEEE Photonics Society, I am convinced that the society sincerely wants to advance our field as much as possible and that its staff works incredibly hard to promote and assist its members. This in itself is motivating!

**What Specific Assets Do You Bring to the Table as a Committee Chair?**

I have worked in a range of cultures and technical fields and (so far!) have managed to find solutions to technical challenges, clarify and address issues, and identify approaches that deliver “win-win” results.

**Mention One Thing that You Have Changed and One Thing that You Want to Switch to Improve the IEEE Photonics Society?**

To bring about positive change, in new efforts for globalization, we have expanded our team, adding many new members from Africa and the Mid-east, and setting up a European outreach group consisting of representatives from academia and industry.

In a switch, I want to make it easier for inter-regional cooperation to take place. For this reason, the European outreach group has created a new website that (amongst other tasks) collects and publishes inter-regional funding opportunities. This group has also recently hosted its first joint team meeting (in hybrid mode) for the European, Mid-east, and African globalization communities, to enable better communication and collaboration.

**Can You Name a Person Who Has Had a Tremendous Impact on You as a Leader? Maybe Someone Who Has Been a Mentor to You? Why and How Did This Person Impact Your Life?**

Two important early influences were my undergraduate supervisors and my Ph.D. supervisor. During my undergraduate studies, I quickly learned how to resolve complex analytical tasks independently and successfully in physics, which was excellent preparation for working in tough times. My Ph.D. supervisor was a great enthusiast for his topic in my doctoral studies and helped me find my passion for working in device physics. Together, these experiences helped me to develop both survival skills and a passion for my field.

**What Are the Most Important Decisions You Make as a Leader of the IEEE Photonics Society?**

How to focus and make the most of limited time and resources to enable progress on a critical task.

**How Would You Advise Members Who Want to Become More Involved in Society?**

Do excellent technical work, present this at Society conferences, talk to other members of the Society and figure out where your enthusiasm lies and how you fit in and contribute to the Photonics Society’s goals. Follow up if you see a good match!

**Why do You Think Members Should Be Involved as Society Volunteers? What Are the Benefits?**

“No man (no one) is an island,” to quote John Donne (British poet),—we can only thrive in photonics by collaborating with others. Working with the Society gives an invaluable network that applies to finding opportunities and talking to other members, developing technical friendships, and better understanding how best to prosper in a healthy balance of personal and professional success.

December 2021
What Advice Would You Give Someone Going Into a Leadership Position for the First Time?
Be realistic about what you can do while keeping other responsibilities in mind. Make decisions based on the actual circumstance, as accurately as possible, rather than how you would like it to be. Find and cherish colleagues and friends you can trust for guidance, especially if their (fair, honest) feedback is challenging to hear.

How Do You Ensure that the IEEE Photonics Society and Its Activities Are Aligned With Your Core Values?
Be aware of your own core values (self-awareness), the Society’s goals and values (situational awareness), and make decisions based on the facts.

When Faced with Two Equally Qualified Candidates, How Do You Determine Whom to Choose?
It’s critical to have a good fit in terms of attitude and goals. A driven, productive team member is often far more beneficial than a brilliant but less upbeat applicant or a candidate that pulls in a different direction to the rest of the team.

What Is One Characteristic That You Believe Every Leader Should Possess?
A clear sense of direction (a compelling story) and the persistence to make it happen.

What Is One Mistake You Witness Leaders Making More Frequently Than Others?
It is often very challenging to balance defending your own local team’s interests with being a good and constructive member of the broader community in your organization: too much in either direction can be destructive.

Do You Have a Favorite IEEE Photonics Society Story?
I was an IEEE model …! Drs Katrin Paschke and Xiaozhuo (Joe) Wang, two colleagues from the FBH in Berlin, and I attended the IEEE Photonics Conference in 2011, where we were photographed while participating in the exhibition. The IEEE staff used a large photo of us in their booth for several years to promote and encourage membership in the Photonics Society.

Tell Us Something Fun About Yourself!
I have had a wide range of professional and personal experiences and try to always remain open to new experiences and opportunities. After my Ph.D. studies and first job in the UK, towards the end of the telecom boom, I relocated to the west coast of the USA, where I still have many friends. During my time there, I turned blonde and had a great, fun, and very productive time. I am now a happily rooted German citizen living in Berlin and have recently welcomed a beautiful new baby to our family, currently three months old.
I’m excited to take some parental leave to care for him and spend time with our expanded family!

This column is prepared by Naznin Akter, PMP® (naznin@ieee.org). Any questions or suggestions for the improvement of this column are highly appreciated.
I would like to introduce you to Rodolfo A. Carrillo Betancourt, a Ph.D. student at the Laboratory of Photonic Devices and Optical Fiber Sensors at the Materials Research Institute from the National Autonomous University of Mexico (IIM-UNAM), who is sharing his exciting work on fluorosensors. Oscar González-Cortez, a Master student in the Microfabrication Laboratory from the Microwave Photonics Group in the Institute for Applied Sciences and Technology (ICAT), UNAM shares his current work along with the roots of how he got excited about optics and photonics. And Yu He, a postdoc at the Department of Electronic Engineering of Shanghai Jiao Tong University in China shares how his research helps the developments in the communication industry.

Did you also get inspired by these stories and would you like to share your own? Please get in touch and tell us what fascinates you about the work and research that you are doing. We would like to hear from you.

Senta Jantzen
S.Jantzen@ieee.org

We are therefore exploring different designs for optical fiber bundles that could fulfill this requirement. In addition, biomolecule discrimination is done through the fluorophores incorporated in the polymer coatings. In some cases coatings with more than one fluorophore will be required in order to improve the detection; therefore, the coating design will require optimization as well. Interesting, isn’t it? We still don’t know if this kind of sensors will be used in clinical applications in the future, but in the meantime, I am learning fun things that can be done with photonic devices.

My name is Rodolfo A. Carrillo Betancourt, I am a Ph.D. student at the Laboratory of Photonic Devices and Optical Fiber Sensors at the Materials Research Institute from the National Autonomous University of Mexico (IIM-UNAM). My research interests include bioimaging, biophotonics and optical biosensors. I am currently working on the fabrication of fluorosensors based on fluorescent coatings deposited on optical fibers. The goal of my project is to evaluate the applicability of these devices in bioimaging, and in particular for the detection of autofluorescence from biological samples.

Because the autofluorescence signal is weak, its detection is generally complicated, and even more so if it is located in the UV region, where some devices have poor sensitivity and transmission. Since the UV emitted light will be converted to visible wavelengths by the fluorescent coatings, we expect that fluorosensors will provide a simpler means to analyze autofluorescence signals. I find this kind of fiber optic biosensors very interesting because their design requires the integration of optical fibers with polymer coatings; they also need to have a wide field of view in order to capture as much light as possible.

My name is Oscar González-Cortez, I obtained my bachelor's degree in electrical engineering at the Engineering School of National Autonomous University of Mexico (UNAM), in Mexico City. I am currently concluding my master’s degree working in the Microfabrication Laboratory from the Microwave Photonics Group in the Institute for Applied Sciences and Technology (ICAT), UNAM. My research project is based on efficient coupling between different slightly multimodal and few-mode waveguides using custom mode field adapters, whether they are optical fibers or integrated waveguides. I theoretically investigated the considerations necessary to design these adapters and minimize the mode dependent losses in the transmitted spatial modes, especially for the higher-order modes. Preserving the higher-order modes enables the use of...
large capacity waveguides with spatial and mode multiplexing systems, which could promote an increase in data transmission. This is of great interest in telecommunications and sensing applications.

I first walked into the lab a few years ago at the Photonics and Optical Fiber Devices Laboratory in the Research Materials Institute (IIM), also at UNAM. I eagerly started to work on subjects related to tapered optical fiber devices and embraced it as my bachelor’s graduation project. Since then, I have enjoyed working with, using, and fabricating optical, photonic, and optoelectronic elements, as well as designing and manipulating micrometric-sized devices. At the present date, I collaborate with both laboratories, ICAT and IIM, to learn as much as possible. I look forward to gaining more experience in the fiber optic industry and design new devices for use in laboratories.

My name is Yu He, I am a postdoc at the Department of Electronic Engineering of Shanghai Jiao Tong University in China. My focus is on silicon photonics devices, such as optical filters, (de)multiplexers, and polarization controllers. It is of great interest to design and fabricate integrated devices, which can be used in data centers, on-chip interconnection and for many other applications.

In the picture, I am working on wafer cleaning using an ultrasonic machine. After that, the prepared chip will go through lithography and etching, so the pattern we designed in our head can be transferred to a SOI chip. With the standard CMOS processes, we can fabricate any graphics in the nanoscale. There is a sense of accomplishment to see the fabricated devices can be used in the real world to accelerate the development of the communications industry.

“Nick” Cartoon Series by Christopher Doerr

December 2021
Book Review: Programmable Integrated Photonics

Reviewed by Ryan Aguinaldo, IEEE Photonics Society Newsletter Editorial Staff

The field of photonic integrated circuits (PIC) has shown its maturity in recent years. Integrated photonic systems, once found chiefly in academic and R&D labs, are now routinely produced in the commercial market for a variety of end applications. Commensurate with the field’s maturity, several textbooks and monographs have been published in the last few years to either serve as introductions to PIC design methodology or as tutorials summarizing the vast literature. It is therefore timely and fitting for Capmany and Pérez to release their new contribution, which they assert is “the first comprehensive, up-to-date and self-contained introduction to the field of programmable integrated photonics.”

The underlying, implicit thesis of Programmable Integrated Photonics is that the “application specific photonic integrated circuit (ASPIC) paradigm completely dominated the field of integrated optics;” however, we are now at an inflection point where the demand of emerging applications will necessitate the PIC community to further mature towards providing systems with full flexibility and reconfigurability. On this note, the book takes off with an introduction to the fundamental technology and analogies to traditional electronic logic and field programmable gate arrays (FPGA). The reader is then instructed on common design and analysis techniques and is offered tutorials covering the evolution-to-date of PICs, especially those which have been “fundamentally application specific,” but which have also included reconfigure components; such work thus lays the foundation for fully programmable integrated photonics.

The remaining two-thirds of the book constitute the primary focus wherein less overlap of material is expected with other volumes generically covering integrated photonics. The integrated architectures that are covered fall broadly into the categories of multi-port interferometers and waveguide meshes. The former being used for arbitrary $N \times N$ unitary transformations and $N \times M$ non-unitary transformations in strictly feed-forward configurations. The latter considers meshed topologies formed by a replicated unit cell where feedback is utilized. After highly theoretical descriptions of these architectures, issues of practical implementation are considered. To help justify the complexity of programming waveguide meshes, the authors describe the challenges faced by a hypothetical photonic designer relying on a non-programmable topology and iterated fabrication runs, who finally gets everything just right only to then be asked to add a new waveguide port. Undoubtedly, this is a situation faced by many former graduate students!

Various applications are then presented, including switching and routing, artificial intelligence and neural networks, microwave photonics, signal processing, and quantum computing. Of mild and inconsequential curiosity is that the chapter on quantum applications is placed prior to the chapter on classical applications, even as the authors admit that the “probably wider area of application of programmable integrated photonics is in classical systems.” Such chapter placement was likely chosen so that the classical applications can be juxtaposed with the book’s final chapter on Field Programmable Photonic Gate Arrays. This closing discourse is mostly a forward-looking discussion with some very preliminary results on the other things that are needed beyond programmable waveguide meshes to ultimately realize the photonic analogue of the electronic FPGA.

The introductory chapter of Programmable Integrated Photonics is to be noted for its brief yet compelling contrast between emerging programmable photonics and the rich history of programmable electronics along with its market drivers. Indeed, several references are made to excellent tutorials from the electronics literature, of which optical engineers may not necessarily be cognizant. The final chapter revisits and extends this contrasting discussion to further motivate and forecast trends for future photonic FPGAs.

So is this a textbook for beginning graduate students or is it a monograph to give interested researchers a comprehensive review of the field? Programmable Integrated Photonics seems to be something in between. To the authors’ credit, the citations are exhaustive; however, the book does not have the flavor of merely elaborating on the best results found in the literature. Rather, design principles are intertwined in the discussion as are the potential issues a designer may encounter. Likewise, the mathematical description of the basic building blocks given at the beginning is complete and allows one to fully synthesize and analyze cascades of photonic components; however, later chapters may leave the reader wanting when an equation is seemingly pulled from the æther. Yet, that later chapters do not shy away from the mathematics goes far to showing the reader how to design programmable integrated photonics rather than only discussing past designs. This book will therefore be a useful addition equally to those wanting to learn its design principles and those looking for an up-to-date account of integrated photonics.
With the untimely passing of Jane Marie Simmons on August 25, 2021, the optical networking community lost a giant. She worked in this field for almost three decades with unbounded energy and unmatched enthusiasm. She advanced and nurtured the field as a visionary researcher, pragmatic practitioner, and inspiring teacher. She left a legacy that will not be forgotten.

Jane started her work on optical networks in the mid-1990s while she was at Bell Labs/AT&T Labs Research. At that time, she focused on the network architectural aspects of Optical Regional Access Networks (ORAN), which was a part of the highly influential, DARPA-supported, Multiwavelength Optical Networking (MONET) program. The purpose of this program, which included the U.S. telecommunications giants: AT&T, Lucent, Verizon, SBC and Telcordia, was to advance the vision of all-optical backbone and regional networks. Concurrently, ORAN spawned another program on Optical Networking for Regional Access with Multiple Protocols (ONRAMP), which was an off-shoot of the earlier, consequential, DARPA-supported All-Optical Networks (AON) program, which included AT&T, MIT and DEC. In the early 2000’s the vision pioneered by these and other research programs were turned into reality by the Corvis Corporation, which was the first company to commercialize all-optical, backbone networks by introducing a fiber-optic transport system having thousands-of-kilometers of optical reach, together with the associated optical switching equipment. Jane played a key role at Corvis as an Executive Engineer and later as the Chief Network Architect, where she developed novel network designs and highly efficient and scalable networking algorithms that fully exploited this technology and made it a practical reality. This culminated in the first commercial deployment of a national-scale all-optical network (the Broadwing network). Jane also performed all-optical network designs for a broad array of North American and European carriers, where she demonstrated that, in these diverse and real environments, all-optical networks are much more efficient and economical than their conventional counterparts, which were based on optical-to-electrical-to-optical (OEO) conversion. While some commercial system vendors at that time had introduced optical switching in their networks, they still had excessive OEO conversion in their backbone network implementations because they did not have ultra-long-reach optics. Today, all national and international carriers and service providers are installing all-optical networks, or more accurately, “optical-bypass-enabled networks”—a term that Jane later introduced.

In 2003, Jane founded her current company, Monarch Network Architects (http://www.MonarchNA.com), which provided optical network architectural services and tools for carriers, system vendors, and the government. In 2006, she played a crucial role as a subject matter expert in creating the DARPA-supported Core Optical Networks (CORONET) program, which had two performing teams involving major U.S. telecommunications companies (one with AT&T and Telcordia and the other with Verizon and BBN). The aim of this program was to advance the state-of-the-art of next-generation, highly dynamic, and highly resilient, multi-terabit, core all-optical networks. The program made several important advances in fast provisioning and restoration in IP-over-optical, national- and global-scale networks.

In 2008 she wrote a book on Optical Network Design and Planning (published by Springer), in which she summarized her vast acquired knowledge in optical network design and the associated networking algorithms. The book proved to be popular among expert and beginning researchers and practitioners, which resulted in her updating the material and publishing it as a second edition in 2014. She also published many journal and conference papers, wrote two book chapters, and holds several patents, all on optical networks, networking algorithms, and related photonic technologies.

Jane received a B.S., Summa Cum Laude, from Princeton University in 1985, and S.M. and Ph.D. degrees from MIT in 1990 and 1993, respectively, all in Electrical Engineering. She attained the grade of Fellow of the IEEE in 2011 “for contributions to optical network architecture and algorithms.”

She always believed strongly in the importance of providing volunteer services to professional engineering and scientific societies, and she practiced what she preached in a big way: She served as the Editor-in-Chief of the Journal of Optical Communications and Networking (JOCN) from 2017 and a member of the Steering Committee of JOCN since 2013 (Associate Editor from 2009 to 2012) till the time of her passing. She also served as an Associate Editor for the Optical Communications and Networking series of the Journal of Selected Areas in Communications (JSAC) from 2004 to 2009. She was a member of the Optical Fiber Communications (OFC) conference Steering Committee from 2007 to 2012, then again from 2020 till the present time. She served on the IEEE Photonic Society Fellow...
Jane was a tireless leader of the IEEE Photonics Society, serving as a member of the Evaluation Committee from 2013 to 2017, including two years as the Chair and one year as the Vice-Chair. Moreover, for more than 15 consecutive years, she gave a popular course at OFC on “An Introduction to Optical Network Design and Planning,” which was based on her iconic book.

As the sole Editor in Chief of JOCN (before her the journal always had two co-Editors-in-Chief), she had to confront a number of tough challenges. While she understood the need for quick reviews, she would not sacrifice quality of the reviews for expediency. She also had the good judgment on what constitute good and useful research. Her insights into what is “useful” research helped guide her appointment of associate editors and the publishing of several special issues on important topics. Her strong will was a rare asset, and she channeled her positive energy and determination to fight for what she thought was the best for the field. The community owes her tremendously for building JOCN into a first-rate journal and sometimes acting as the conscience of the OFC Steering and Program Committees.

Throughout her career, her dedication to her work, her friends, and for making the world a better place had no limits. She was hard on herself, her standards were high, and she stimulated others to follow her example. Whenever she undertook a task, she gave it her all. And if you happened to be involved in the same task, you better do the same, else she will let you know about it. She was an enthusiastic follower of many sports, but particularly baseball. She enjoyed walking, running, and travelling throughout the US and around the world. She liked many places, but she always loved the Jersey Shore, from Cape May to Sandy Hook, particularly in the summer.

Jane, thank you for stopping by to brighten and enrich our lives, for outstanding service to our community and for generously providing us with your treasured friendship and guidance. You will be sorely missed by your many friends, colleagues, and students. Your legacy will not be forgotten. May you rest in peace.

In lieu of condolences, Jane’s family requests for contributions to be made to St. Jude’s Children’s Research Hospital.

Adel A. M. Saleh – UCSB
Patrick P. Iannone – Nokia Bell Labs
Vincent W. S. Chan – MIT

---

IEEE Photonics Society Restructures Volunteer Leadership—Important Changes to the Society Bylaws

The IEEE Photonics Society Constitution and Bylaws committee has reviewed our current society bylaws and have recommended revisions to better define the restructuring of our volunteer leadership and bring our bylaws in line with current practices.

The Society’s Board of Governors has approved the proposed changes to the Photonics Society Bylaws to maximize our volunteer and staff resources and to better align our governance structure with current operations.

Summary of Major revisions:

- 9.3 Executive Coordinating Committee; Updated to Executive Committee (ExCom) with outline of Committee responsibilities.
- 10 Vice President Technical Affairs; Updated to Vice President Professional & Technical Development with outline of responsibilities and updated language for newly defined position as approved by BoG; October 2020.
- 14 Vice President Finance and Administration; position removed
- 14.1 (Now 14) Awards Committee; updated language to better define committee formation and responsibilities

A number of minor amendments have also been made to update the Bylaws.

This new document has now been approved by both the Photonics Society BoG and TAB. It is a requirement of the Photonics Society Constitution that all amendments should also be reviewed by the Photonics Society members. The amended document can be viewed on the Photonics Society portal (http://photonicssociety.org/) under the “Who We Are” tab.

Please take time to look at the web site and understand the new Photonics Society Bylaws Please e-mail any comments to k.mergner@ieee.org
Careers and Awards

Royal Academy of Engineering Inducts IEEE Photonics Society Fellow, Professor Nabeel Agha Riza

IEEE Photonics Society Fellow and Chair Professor of Electrical & Electronic Engineering, Nabeel A. Riza of University College Cork, Ireland was inducted into the Royal Academy of Engineering, UK’s National Academy of Engineering. Induction to the Academy is a prestigious UK honor awarded to high impact engineering professionals. Membership is diverse and includes Nobel Prize winners and UK’s Lewis Hamilton, 6-time Formula One Racing World Champion. Riza was elected as a global prize-winning inventor of light-based technologies including invention of the all-digital fault-tolerant fiber-optic equalizer deployed in the global internet. Sir Jim McDonald, President of the Academy stated: “Our Fellows represent the best of the best in the engineering world.” The induction ceremony was held 11 October, Prince Philip House, London.

For more information on the Royal Academy of engineering please visit: https://bit.ly/3CAAOHi

IEEE Women in Photonics
Leading a Brighter Future

IEEE Photonic Society’s Women in Photonics program provides educational development that supports the participation, engagement and advancement of women in the photonics and optics community.

WIP GOALS

- Encourage and support next generation of women in photonics through STEM outreach and mentorship.
- Encourage gender inclusion within photonics community and Society; editorial boards, conference committees and leadership positions.
- Create new volunteer opportunities, local affinity groups and recognition programs to empower women members.
- Develop diverse educational programs, outreach initiatives and training resources.

The Women in Photonics program is also seeking to diversify the range of individuals and perspectives influencing the photonics technology and information of tomorrow.
THOMAS R. CLARK JR.

(M’09-SM’05) is supervisor of the Optics and Photonics Group and a member of the Principal Professional Staff at the Johns Hopkins Applied Physics Laboratory in Laurel, MD. He has been involved in volunteer work for the IEEE Photonics Society (IPS) at the local and international levels for many years. He was the Founding Chair of the Baltimore Chapter from 2004 through 2006 and served on the IPS Technical Committee on Microwave Photonics from 2006 to 2012, including three years as the Chair. He was the 2014 Technical Program Chair, 2015 Member-at-Large and 2016 General Chair for the IEEE Photonics Conference (IPC) and a member of the Photonics Society Conference Council 2014 through 2017. He is currently in his second year serving as the IPS Education Committee Chair coordinating and advising on educational activities across the world and covering all student (K-20 STEM) stages as well as professional member continuous education and development.

AMR S. HELMY

(S’94-M’99-SM’06) is a professor in the department of electrical and computer engineering at the University of Toronto. Since his involvement with IEEE, he has served on numerous technical subcommittees within the Photonics’ flagship conferences. Amr has chaired the conference on laser and electro-optics (CLEO) as well as Photonics Society’s IPC. He currently represents the society on the steering committee of the IEEE Quantum Initiative as well as the steering committee of the IEEE Heterogeneous Integration roadmap. Amr has also served as Vice President-membership for the IEEE Photonics Society 2008-2010. In addition, he has served as a guest editor for various issues of the Journal of Selected Topics in Quantum Electronics. He has also served as an Associate Editor for the Photonics Journal.

ROLAND RYF

(M’01-SM’17-F’19) is director of the Advanced Photonics Research department at Nokia Bell Labs, Murray Hill, NJ. He has participated in the organization of numerous IEEE Photonics Society (IPS) conferences over the years, he has served as committee member of the Conference on Lasers and Electro-Optics (CLEO), the Optical Fiber Conference (OFC), co-chaired at IEEE summer topical conferences and is currently technical co-chair for OFC 2022. He has also been active in societal journals, he served as associate editor of the IEEE/OSA Journal of Lightwave Technology (JLT) and is currently serving as member of the JLT steering committee. Further, he served in various roles within the IPS membership and publication councils and is currently serving as member of the IPS Professional Advancement Committee.

ELAINE WONG

(S’99-M’02-SM’14) is currently Associate Dean (Diversity and Inclusion) and Professor at the Faculty of Engineering and Information Technology, University of Melbourne. She has actively served the photonics community in the past 18 years through her involvement with IEEE Photonics Society (IPS) co-sponsored conferences, such as OFC (2021 N4 Subcommittee Chair), IEEE CLEO-PR (2020 C9 Subcommittee Co-Chair), IEEE Summer Topicals Meeting Series (2019 Topic Co-Chair), Opto-Electronics and Communication Conference, (2014 TPC Co-Chair), and Asia Communications and Photonics Conference (2021 Sub-Committee Chair). In 2021, she was appointed Secretary, Steering Committee of the IEEE/OSA Journal of Lightwave Technology, having previously served as Associate Editor from 2011-2017. She was also Associate Editor of IEEE/OSA Journal of Optical Communications and Networking from 2009-2012. She served on the IPS Distinguished Lecturer Committee in 2013 and 2014 (as Chair).

Visit www.PhotonicsSociety.org to learn more.
CALL FOR NOMINATIONS

IEEE Photonics Society 2022 Distinguished Service Award

Nomination deadline: 30 April 2022

The **Distinguished Service Award** was established to recognize an exceptional individual contribution of service that has had significant benefit to the membership of the IEEE Photonics Society as a whole. This level of service will often include serving the Society in several capacities or in positions of significant responsibility. Candidates should be members of the Photonics Society. The award is presented at the IEEE Photonics Conference formerly known as the IEEE Photonics Society Annual Meeting.

Visit the on-line awards platform to nominate a colleague today: https://bit.ly/3ErfhSf

---

Call for Nominations IEEE Photonics Society 2022 Distinguished Lecturer Program

Nomination deadline: 16 FEBRUARY 2022

The **Distinguished Lecturer Program** was established to honor excellent speakers who have made technical, industrial or entrepreneurial contributions of high quality to the field of lasers and electro-optics, and to enhance the technical programs of the Photonics Society chapters. Consideration is given to having a well-balanced variety of speakers who can address a wide range of topics of current interest in the fields covered by the Society. The term for the Lecturers is July 1 of the year of election until 30 June of the following year. Candidates need not be members of the IEEE or the Photonics Society.

Nominate Here: https://bit.ly/2Zou00W
Membership

Chapter Spotlight: Humanitarian & Student-Driven Activities Led by Chapters in Africa

The IEEE Photonics Society’s Membership Council, its respective Committees, i.e., Globalization, Diversity Oversight, Education, as well as the Humanitarian & Public Imperative Committee have granted several student chapters throughout Africa with educational and/or humanitarian funding.

Below are a few high-impact projects that took place in the second half of 2021, which garnered internal and external accolades across the IEEE and photonics community-at-large.

IEEE Kenyatta University Student Chapter Nanosatellite Project

From the tiny room of the Chandaria Incubation Centre at Kenyatta University in Kenya, student leaders of the University’s IEEE Photonics Student Chapter and IEEE Student Branch created a nanosatellite prototype granted by the Kenya Space Agency (KSA). The IEEE Photonics Society also supported the prototype project with educational seed funding to help organize a series of training sessions.

The nanosatellite, named “KU Cube”, measures 10 by 10 centimeters, and weighs one kilogram, which the team says was one of the conditions set by the regulator, the KSA. It is designed to be light to launch but also to cut cost once mass-produced. The team of 11 student members and three advisors, drawn from different disciplines, have been working on the project since last year.

“We took up the challenge after a call for proposals by the Kenya Space Agency last year. Fast and effective communication has become crucial in life and satellites will become a must in the future,” says Fidel Makatia, the team leader and chapter chair.

In October, the nanosatellite was launched at a formal ceremony and is currently operating in test orbit. It will orbit 37 kms from the Earth’s surface for two years before, if all goes well, the agency plans to launch a space-grade satellite into space. The lower earth orbit phase is set for 2022.

The KU Cube is made up of locally manufactured materials, the computer motherboard, and the operating system. The cube is powered by a small solar panel fitted to it and the outer case was 3D printed at the university. It has a low-resolution camera that will send pictures to the ground.
station, located at the university, where it will be processed and interpreted.

The overall purpose of the nanosatellite is to help farmers in Kenya predict and mitigate agricultural disasters, such as locust invasion. The students also focus on aerial surveillance and gathering information on weather patterns and natural disasters, like flooding, that are likely to affect farmers.

The KSA in 2020 supported the creation of five model satellites, all serving different humanitarian and sustainable needs, and launched the satellites on October 14, 2021. The universities granted funding by the KSA were: Kenyatta University (KU), Moi University, Jomo Kenyatta University of Science and Technology (JUKUAT), the Technical University of Kenya (TUK) and the University of Nairobi (UON). JKUAT, in which the Society also has a student chapter, launched a satellite that encompassed a thermal imager. The imager was designed to monitor surface temperatures and additional tasks, such as tracking wildebeest migration.

Speaking at the 2021 event was the acting director-general of KSA, Col. Hillary Kosgey, who affirmed the agency’s commitment to support space systems, engineering, and development research at the university level. The KSA plans to further its support and has contracted Swift Lab, an aerospace startup that develops drones to maintain, produce and fly the nanosatellites in the future.

Excerpts for this article came from IEEE Kenyatta University Student Chapter reports and All Africa/Daily Nation releases: David Mucungu; Photo Credits: Kenyatta University

IEEE Kyambogo University Student Chapter “Pads for Her” Project

The IEEE Kyambogo University (Uganda) Student Chapter actively supports underserved communities and women by collaborating on a social impact program called “Pads for Her”, which addresses the need for Sustainable Reusable Sanitary Pad training. The Chapter held a reusable pad training event funded by IEEE Women in Photonics, IEEE Uganda Section Branch, and IEEE SIGHT in Karamoja, Uganda with over 100 participants—girls, boys, parents, and educators from local school districts.

Period poverty in Africa affects girls and women by preventing them from working and going to school. Per UNESCO research, one in 10 girls in Africa miss school because they don’t have access to menstrual products, or because there
aren’t safe, private toilets to use at school. In Kenya alone, approximately 50 percent of school-age girls do not have access to menstrual products and throughout Sub-Saharan Africa, for example, some girls will miss as much as 20% of their school year; some may drop out of school altogether. With limited education, there is less of a chance for girls to lift themselves and their communities out of poverty. This creates stigma surrounding periods.

The training was designed to promote sustainability and independence for young women pursuing academics. The goal is to eliminate the barrier to stay in school and the Section plans to train over one million schoolgirls on how to make their own reusable pads in the next 5 years.

The IEEE Kyambogo University Student Chapter plans to facilitate additional training in 2022 and partner with organizations where girls’ clubs can learn about their bodies, menstruation, and health, as well as build confidence and come together to advocate for their education and rights.

Excerpts and stats for this article came from ActionAid.org and BorgenProject.org. Photo credits: Kyambogo University

IEEE JITUAT Solar Installation Project

Blessed Peace Children’s Home, Makindu, Kenya

“Science can amuse and fascinate us all, but it is engineering that changes the world”, as Isaac Asimov, Professor of Biochemistry, put it. There is no limit to the possibilities engineering has in empowering and changing the lives of millions of people who feel powerless and forgotten in society. This simple cause led a team of six [Lydia Kipkorir, Leah Ndirangu, Dorcas Litunya, Delphine Nyahoko, Laurene Ngoya, and Rosemary Litunya] from IEEE Photonics JITUAT Student Chapter, in Kenya, to use its annual seed funding for a project aimed at building a standalone photovoltaic system for a children’s facility in a marginalized, off-grid community. The student’s leaders set out to empower children to learn while using a renewable source of energy.
Planning Phase
The project commenced by searching for a suitable children’s home. This process took quite a while because the Chapter conducted countless interviews with prospective centers. They relied on their community to help find the most suitable and deserving center for this project and were drawn to a childcare center, Blessed Peace Children’s Rescue Center, in Makindu, Makueni County. In Makindu, the Chapter found that the high rate of poverty caused the inhabitants of the area to abandon children not out of negligence, but due to being able to provide basic needs. This led to children being left at the hands of the rescue centers. The center was in a marginalized community that had no access to electricity, and the kids required electricity to learn as well as for security.

Blessed Peace Children’s Rescue Center has a capacity of 185 children among whom: 10 are in university, 25 in secondary school, 140 in primary school, and 10 are below 5 years, yet to join school. On reaching the site, the Chapter immediately knew it had found the right place to conduct the project. There were so many young kids in primary school who would really benefit from being able to study at night, especially during the closure of schools over the pandemic.
This was one big step for the team, as the site was 5 KM from the main power grid.

On account of finding a suitable site for the project, the student leaders began designing the photovoltaic system with the help of incredibly talented engineers in this field who took their time to assist [Ignatius Maranga (Advisor, IEEE JKUAT IPS Student Chapter & Renewable Engineer), Kithinji Muriungi (Chair, IEEE IPS Kenya Chapter) and Steve Ngoje (Senior Solar PV Design Engineer, Illumina Africa)]. The next big step was looking for good suppliers, accumulating different quotations and picking the most feasible option for purchase. After analyzing the different quotations, partnering with Chloride Exide Kenya, Ecodesh Power Solutions and Illumina Africa Limited were the best options. After purchasing the equipment, what was left was setting a date for execution and getting more volunteers to join the team during the implementation of the project.

Implementation Phase

On the first day of the project 23 volunteers, both IEEE and non-IEEE members, joined the effort. The volunteers set out on their journey to Makindu (Almost 200KM from Nairobi) in the early morning to ensure an early return due to COVID-19 curfew restrictions. The Chapter reached Makindu safely and were cordially welcomed by the children and their caretakers. The volunteers played a few games and interacted with the kids before they started the actual work. It was nice to bond with children and get to know the center which would be impacted greatly by the project. I was clear that they felt safe with us.

The Chapter was divided into different teams. Some were on the roof while others were working on mounting the inverter on the wall. The volunteers worked until darkness encroached. On Day 2, the volunteers set out to make more progress on the project, re-visiting the following weekend with a few volunteers. This time the Chapter recruited a few apprentices among the kids from the children’s home, Wamhua and Kelvin, who were so eager to learn and try to understand how the system worked. They helped with getting us the tools and asked thoughtful questions throughout the process.

However, it is typical for any project to encounter challenges! After finalizing all the connections, the volunteers went ahead and switched on the system to see if it worked. And Alas! To our surprise the bulbs lit for about 3 seconds and then the inverter detected an error. It was such an anticlimax for us since we were so excited, but a system design error caused the fuse in the inverter to blow. We then had to return it to our supplier to fix the component, and return it.
Ecodesh, the supplier, was more than willing to assist with everything. The Chapter obtained the items needed for additional protection, got the fuse replaced, and headed back the following weekend with more caution. After connecting again, the system was switched on and the bulbs lit, and this time everything worked! It was a great feeling. The kids from Blessed Peace Makindu Children’s Home now had electricity. Their patience had finally paid off, especially for Wambua, Kelvin, and their guardian Samson who had been with the student leaders throughout.

Everything the Chapter worked so hard for as a team was accomplished. Moreover, the kids were so happy that they finally had electricity. For every hardship encountered, inspiring a few future engineers among the kids made it all worth it. The student leaders couldn’t express enough the beauty that came from making a difference. It was priceless, and embodied what IEEE emphasizes by inspiring the world with technology.

This project gave the student members firsthand experience that was truly life changing and eye-opening to the limitless possibilities the engineering profession can offer.

Special thanks goes to: IEEE Photonics Society Staff & Leadership; the IEEE Photonics JCUAT Chapter volunteers: Lydia Kipkorir, Leah Ndirangu, Eunice Vele, Sera Mania, Mercyline Tume; the IEEE Kenya Section Volunteers: Sally Musonye, Mercy Chelangat, Eshorn Orina, Maria Chaltin, Kithinji Muriungi; the Blessed Peace Children’s Home family and other volunteers: Cliff Mburu, Kendi Muchungi, and Joe Kuria; and all partners who participated during the project design, implementation, and commissioning.

This article was contributed by: By: Lydia Kipkorir (Chair, IEEE JCUAT IPS Student Chapter) and Leah Ndirangu (Vice-Chair, IEEE JCUAT IPS Student Chapter). Photo Credits: IEEE Photonics JCUAT Chapter.
In my many volunteering activities with the Photonics Society and the IEEE, several of the past presidents have served as my role models. In particular, I would like to thank Prof. Chennupati Jagadish, 2020–2021 Past President, for his sound advice and guidance during these two years in which the Society had to endure new challenges. Multiple conversations with IEEE Communications Society President, Prof. Vincent Chan, helped me learn how sister societies were handling similar issues we were confronting, and the possibilities we had at hand. Working along with Executive Director, Doug Razzano, across the issues that needed the most attention has been invaluable. Doug brings to the Society a wealth of expertise. He is on top of every detail of the IEEE Photonics Society’s efforts and keeps financials well managed.

There is certainly much more to do towards enhancing the Society’s reach and impact on the Photonics community. The reality we lived over these past two years taught us it is possible to communicate and interact via online platforms effectively, when these activities are time bounded. Thus, new opportunities are opening to reinvent how to cater to the Photonics professional community-at-large. These are indeed very exciting times!

I pass along the lead role of President of the Society to my colleague Dr. Rene Essiambre who has been an Elected Member and an accomplished volunteer for many years, serving conference steering committees, publications, as Vice President of Membership 2017–2019, and Chair of the Society’s Globalization committee. Rene will bring to the Society the perspective of industry members, as he is a Distinguished Researcher at Nokia Labs.

I would also like to welcome Prof. Zetian Mi as the new Vice President for Conferences. Zetian has extensive experience in conference organization, including serving as General Chair of the IEEE Photonics Conference. This coupled with his recognized technical contributions to photonics materials and devices will contribute to shape the path forward in conferences with the opportunity to broaden their reach.

Farewell, esteemed colleagues! It has been a privilege to serve as your President over the last two years, and I look forward to serving as your Past President from 2022–2023. We are in an exciting technical field that has enormous potential and that impacts society in so many different ways. I look forward to interacting with all of you in the near future through the many different venues the Photonics Society offers.

With Warm Regards,
Carmen S. Menoni
President (2020–2021)
IEEE Photonics Society
c.menoni@ieee.org
2021 Chapter Awards Announcement

Honoring the Achievements of the Society’s Local Advocates and Leaders Around the World

The IEEE Photonics Society Chapter Awards were established to honor the achievements and educational activities conducted by our Chapters around the world. The Society’s Chapters are made up of advocates and leaders representing our organization around the world, at the local level.

In turn, our Chapters provide our Society members with valuable, and often personalized opportunities, to network—promoting professional growth and continuing education within the photonics community. This includes honoring:

- membership development and growth activities;
- strengthening technical achievements in local photonics communities;
- supporting local workshops and educational events;
- enhancing student, diversity, and Young Professional initiatives;
- and providing more opportunities for volunteer service and altruism.

Each year the IEEE Photonics Society honors selected chapters, in good standing, with the following chapter awards. Please join us in honoring the 2021 Chapter Award Winners for their service.

Chapter of the Year Award
Santa Clara Valley/SF/OEB Jr. Chapter (Silicon Valley, CA)

The Santa Clara Valley/SF/OEB Jr. Chapters within the Section received this honor for their consistent involvement and dedication to the Society’s strategic outreach goals, including centered leadership development, recruitment, and retention. This includes (but is not limited to): the chapter’s novel leadership succession and steering approaches; groundbreaking inaugural IEEE Women in Photonics Affinity Group; contributions to major conference planning (CLEO, etc.); regular mentorship and professional development programming in-person and virtually; and STEM Outreach initiatives (MakeHER workshops, community-led school/company visits, etc.)
Most Innovative Chapter Award
Kyambogo University Student Chapter (Uganda)

The Kyambogo University Student Chapter received this honor for their innovative approaches, such as: STEM outreach programs directed towards reaching young girls and women in rural areas; membership activities and competitions to foster community amongst students and mentors; COVID-19 response that served local health facilities; hands-on Teacher-in-Service programs; and regular “Photonics Week” campaigns that promote the benefits of membership.

Most Improved Chapter Award
Mangalam College of Engineering Student Chapter (India)

The Mangalam College of Engineering Student Chapter received this honor for programs, such as: student leadership trainings to support future thought leader growth; a Graduate Student-led weekly webinar series; a COVID-19, IEEE Humanitarian Activities Committee funded “Portable Mechanical Ventilator” project; hands-on workshops/competitions for undergraduate students, rising students in secondary schools, and IEEE Women in Photonics.
Senior Member Initiative Award
Guangdong Chapter (China) & Bangalore Chapter (India)

This award is determined by elevation percentages and novel approaches. The Guangdong Chapter and Bangalore Chapter will both receive this honor for their recruitment and Senior Member Elevation drives. Each chapter elevated the highest percentage of Senior Members on behalf of the Society within the calendar year, through: innovative member-to-member campaigns, industry visits, and technical event promotional strategies.

Largest Membership Increase Award
Bangladesh Section Chapter & Tokyo Section Chapter (Japan)

This award is determined by recruitment numbers, as well as member development approaches. The Bangladesh Section Chapter and Tokyo Section Chapter will both receive this honor. Each chapter recruited the highest percentage of members on behalf of the Society and their Section within the calendar year. Much of this was done through: active/regular community workshops with prospective members and effective engagement strategies, even over the course of the pandemic.
In this series partnered with WaveJobs we invite people at different career stages to share their experience in Photonics and lessons learned in professional development. Today we interview Dr Gemma Vall Llosera, Head of Automation & AI Innovation from Ericsson Sweden, an experienced technology broker spanning application areas of optics and photonics, quantum computing, artificial intelligence, communications, cloud technologies, Board Member of Photonic Sweden.

Patryk: What is the field of your interest in Photonics, and how did it all start in your life?

Gemma: I come from the classical optics school where light is pictured as rays going through optical elements, lenses and mirrors. Specifically going through human optical systems, the eye. Here is where I started my photonics career. So, I am a licensed optometrist. After that I found renewed interest in optics in the shape of synchrotron radiation. In this case, light was no longer classical but quanta of photons impinging molecules to trigger electronic transitions in atoms. And after that I even considered light not only in vacuum or air systems but also inside a medium such as optical fiber and in silicon. Right now, I am also interested in how photonics, specifically quantum photonics, can help in Ericsson’s digitalization journey. So as you can see, my life has

Don’t Be Afraid to Learn

Patryk Urban, IEEE Photonics Poland, IEEE Photonics Globalization and IEEE Photonics Industry Engagement Committee Member

In this series partnered with WaveJobs we invite people at different career stages to share their experience in Photonics and lessons learned in professional development. Today we interview Dr Gemma Vall Llosera, Head of Automation & AI Innovation from Ericsson Sweden, an experienced technology broker spanning application areas of optics and photonics, quantum computing, artificial intelligence, communications, cloud technologies, Board Member of Photonic Sweden.

Patryk: What is the field of your interest in Photonics, and how did it all start in your life?

Gemma: I come from the classical optics school where light is pictured as rays going through optical elements, lenses and mirrors. Specifically going through human optical systems, the eye. Here is where I started my photonics career. So, I am a licensed optometrist. After that I found renewed interest in optics in the shape of synchrotron radiation. In this case, light was no longer classical but quanta of photons impinging molecules to trigger electronic transitions in atoms. And after that I even considered light not only in vacuum or air systems but also inside a medium such as optical fiber and in silicon. Right now, I am also interested in how photonics, specifically quantum photonics, can help in Ericsson’s digitalization journey. So as you can see, my life has

Don’t Be Afraid to Learn

Patryk Urban, IEEE Photonics Poland, IEEE Photonics Globalization and IEEE Photonics Industry Engagement Committee Member

In this series partnered with WaveJobs we invite people at different career stages to share their experience in Photonics and lessons learned in professional development. Today we interview Dr Gemma Vall Llosera, Head of Automation & AI Innovation from Ericsson Sweden, an experienced technology broker spanning application areas of optics and photonics, quantum computing, artificial intelligence, communications, cloud technologies, Board Member of Photonic Sweden.

Patryk: What is the field of your interest in Photonics, and how did it all start in your life?

Gemma: I come from the classical optics school where light is pictured as rays going through optical elements, lenses and mirrors. Specifically going through human optical systems, the eye. Here is where I started my photonics career. So, I am a licensed optometrist. After that I found renewed interest in optics in the shape of synchrotron radiation. In this case, light was no longer classical but quanta of photons impinging molecules to trigger electronic transitions in atoms. And after that I even considered light not only in vacuum or air systems but also inside a medium such as optical fiber and in silicon. Right now, I am also interested in how photonics, specifically quantum photonics, can help in Ericsson’s digitalization journey. So as you can see, my life has

Don’t Be Afraid to Learn

Patryk Urban, IEEE Photonics Poland, IEEE Photonics Globalization and IEEE Photonics Industry Engagement Committee Member

In this series partnered with WaveJobs we invite people at different career stages to share their experience in Photonics and lessons learned in professional development. Today we interview Dr Gemma Vall Llosera, Head of Automation & AI Innovation from Ericsson Sweden, an experienced technology broker spanning application areas of optics and photonics, quantum computing, artificial intelligence, communications, cloud technologies, Board Member of Photonic Sweden.

Patryk: What is the field of your interest in Photonics, and how did it all start in your life?

Gemma: I come from the classical optics school where light is pictured as rays going through optical elements, lenses and mirrors. Specifically going through human optical systems, the eye. Here is where I started my photonics career. So, I am a licensed optometrist. After that I found renewed interest in optics in the shape of synchrotron radiation. In this case, light was no longer classical but quanta of photons impinging molecules to trigger electronic transitions in atoms. And after that I even considered light not only in vacuum or air systems but also inside a medium such as optical fiber and in silicon. Right now, I am also interested in how photonics, specifically quantum photonics, can help in Ericsson’s digitalization journey. So as you can see, my life has

Don’t Be Afraid to Learn

Patryk Urban, IEEE Photonics Poland, IEEE Photonics Globalization and IEEE Photonics Industry Engagement Committee Member

In this series partnered with WaveJobs we invite people at different career stages to share their experience in Photonics and lessons learned in professional development. Today we interview Dr Gemma Vall Llosera, Head of Automation & AI Innovation from Ericsson Sweden, an experienced technology broker spanning application areas of optics and photonics, quantum computing, artificial intelligence, communications, cloud technologies, Board Member of Photonic Sweden.

Patryk: What is the field of your interest in Photonics, and how did it all start in your life?

Gemma: I come from the classical optics school where light is pictured as rays going through optical elements, lenses and mirrors. Specifically going through human optical systems, the eye. Here is where I started my photonics career. So, I am a licensed optometrist. After that I found renewed interest in optics in the shape of synchrotron radiation. In this case, light was no longer classical but quanta of photons impinging molecules to trigger electronic transitions in atoms. And after that I even considered light not only in vacuum or air systems but also inside a medium such as optical fiber and in silicon. Right now, I am also interested in how photonics, specifically quantum photonics, can help in Ericsson’s digitalization journey. So as you can see, my life has

Don’t Be Afraid to Learn

Patryk Urban, IEEE Photonics Poland, IEEE Photonics Globalization and IEEE Photonics Industry Engagement Committee Member

In this series partnered with WaveJobs we invite people at different career stages to share their experience in Photonics and lessons learned in professional development. Today we interview Dr Gemma Vall Llosera, Head of Automation & AI Innovation from Ericsson Sweden, an experienced technology broker spanning application areas of optics and photonics, quantum computing, artificial intelligence, communications, cloud technologies, Board Member of Photonic Sweden.

Patryk: What is the field of your interest in Photonics, and how did it all start in your life?

Gemma: I come from the classical optics school where light is pictured as rays going through optical elements, lenses and mirrors. Specifically going through human optical systems, the eye. Here is where I started my photonics career. So, I am a licensed optometrist. After that I found renewed interest in optics in the shape of synchrotron radiation. In this case, light was no longer classical but quanta of photons impinging molecules to trigger electronic transitions in atoms. And after that I even considered light not only in vacuum or air systems but also inside a medium such as optical fiber and in silicon. Right now, I am also interested in how photonics, specifically quantum photonics, can help in Ericsson’s digitalization journey. So as you can see, my life has
always revolved around photons to the extend that I thought that if I ever changed my surname it would be to “Fotonberg,” which translated from Swedish would mean the “photon mountain.”

Patryk: Ok, this is really a lot of photons in life! And what do you consider to be your biggest achievement and contribution so far to the development of Photonics science and industry?

Gemma: Unfortunately I have not contributed to any breakthroughs. I am more like the ant that just keeps on working little by little everyday. In science, I went from calibrating fluorescence spectrometers to studying the photon emission of water, deuterated hydrogen, ammonia, benzene molecules and even the fragmentation patterns of the sugar of DNA/RNA molecules.

In industry, I would say that the most important contribution has been during my time at Ericsson research when we set the foundation for dense and ultra-dense optical networks, both in terms of architecture and also for physical layer monitoring using advanced optical time-domain and frequency-domain reflectometry.

Patryk: What excites you most and keeps you motivated to further contribute to this field?

Gemma: Closely following the advance of AI and quantum technologies and the role of photonics in there is very motivating. New photonic-based quantum processors, photonic accelerators by startups claiming better performance than large established players. New photonics chips for quantum key distribution or applications with a shorter time-to-market (TTM), like the generation of random numbers from photonic hardware, look very promising.

Patryk: At WaveJobs we have noticed that many companies struggle to find proper candidates in the field of photonics, while there is definitely visible market demand.

Gemma: First of all, this is a common problem that we also see in the Photonic Sweden organization for which I am a board member. And the problem comes already from universities not having enough students in specific photonics programs. Then also, we need to take into account what kind of industries there are and what competencies they need. There are industries that develop complete photonics components, IR cameras, spectrometers, optical transceivers. This type of companies need expert competence inhouse. Another type of companies that would need optical inhouse competence are those industries that produce some of the optical components for other companies (a CCD camera, a lens, etc). On another end, we have industries that buy optical components (IR camera or an optical transceiver) to integrate in a larger system (e.g., Ericsson wants to embed an IR camera into a Radio Base Station). In this case, Ericsson might decide to build the competence inside or buy it from the third party.

All in all, the type of industry will have a big impact on what competences and the profile of the candidates. As I mentioned, the root problem might already be at the university stage where students are bought in for AI and SW technologies, no longer for HW.

Patryk: Would you share any piece of advice you would give to those looking for first jobs in Photonics or Photonics-related fields?

Gemma: Well, don’t be afraid to learn. What you learn in university might not be a perfect match to the job you are applying for or it might not be the ideal job you were thinking of, but I would say try, and if that position gives you the freedom to learn it might be the most rewarding job ever.

Patryk: Gemma, the steps in your career are the best proof of what you have just said. Thank you very much for the interview.
Special Event Recap: Women-in-Electronics & Photonics Symposium at CSW2021

Compound Semiconductor Week 2021 (CSW2021) was held digitally this year (https://csw2021.se) within the joint venue for the 47th International Symposium on Compound Semiconductors (ISCS) and the 32nd International Conference on Indium Phosphide and Related Materials (IPRM). More than 300 participants presented their research and innovations in more than 30 sessions and workshops, sharing their latest findings on the wide range of compound semiconductor technology frontiers covered in the event.

Qin Wang from the Research Institutes of Sweden (RISE) and Royal Institute of Technology (KTH) with her team in the IEEE Photonics Sweden Chapter organized a Women-in-Electronics/Photonics Symposium as part of CSW2021. The organizers were honored to have Ayodeji Coker, Science Director from the USA Office of Naval Research Global, as the chair of this symposium.

The program included two sessions organized to feature prominent women researchers and leaders in the field. The first session featured welcome messages by Charlotte Karlsson, Vice President of RISE, and Deepa Venkitesh, Indian Institute of Technology Madras, followed by technical talks. Andrews Nirmala Grace, from the Centre for Nanotechnology Research of Vellore Institute of Technology, India led a presentation on “Vanadium nitride nanostructures as efficient Pt-free counter electrodes for dye sensitized solar cells”, Linda Höglund, of IRnova AB, “T2SL and QWIP infrared detectors for gas sensing applications”, and Irina Bouianova, Linkoping University in Sweden, “III-V nanowires from highly-mismatched alloy”.

The second session featured additional notable women, such as: Linda Mondin, of the European Space Agency (ESA), on “Laser Interferometer Space antenna”, Qin Wang, from RISE/KTH, on “GaN based HEMTs for power and RF applications”; Ani Khachatryan, from USA Naval Research Lab (NRL), on “Single event effects in wide bandgap semiconductors”; Shouleh Nikzad, from the NASA Jet Propulsion Laboratory (JPL), on “Nanoscale engineered silicon imagers reaching theoretical limit performance and their application in space exploration and synergistic fields”.

The invited scientists presented their latest results of their cutting-edge research covering a wide range of topics in photonics and electronics, spanning from basic science on quantum structures to industrial IR sensing and space/military applications. They all have made valuable contributions to their R&D fields and serve as role models to inspire young professionals and Ph.D. students to embrace future technology leaps.

One of the invited speakers, IEEE Fellow, Shouleh Nikzad from NASA, was specifically selected by the IEEE Women in Engineering as a Pioneer Electrical Engineer and role model in 2021. She is known internationally for her contributions to ultraviolet, optical, and near-infrared technologies, particularly detectors. She has had a significant scientific impact on UV astrophysics and planetary science, and her achievements in high-performance detectors have enabled UV astrophysics in CubeSat platforms. Her talk in CSW2021 was very inspiring, leading the audience from semiconductor devices/systems to fascinating space applications. She has been also invited to give talks at RISE and KTH during the CSW2021 period through the IEEE Photonics Distinguished Lecturer program. Her lectures were highly anticipated by the organizers as they were planned to reach in-person younger professionals, especially female young students in STEM fields. Unfortunately, because of the COVID-19 pandemic, the planned IEEE Distinguished Lectures couldn’t be held on-site at the Swedish institutions as scheduled.

Ursula Keller from ETH Zurich (Swiss Federal Institute of Technology in Zurich) was one of CSW2021 keynote speakers. Her work has had a significant impact in the area of semiconductor disk lasers, and she is also the first elected president and co-founder of the ETH Women Professors Forum (WPF). Regarding gender equality, Prof. Keller has stated: "When men and women pursue their careers, this means that both can live out their individual dreams. Both can demonstrate their abilities to the fullest and receive recognition for it. This brings joy! In addition, a double income gives a family more security, particularly in times of hardship." More on her talk insights, can be found here: https://eth-wpf.ch

Hannah Joyce, from the Department of Engineering, Cambridge University, won The Young Scientist Award announced during the CSW2021 award ceremony. She was recognized for making significant contributions towards the “engineering of III-V nanowire-based optoelectronic devices and terahertz spectroscopy of compound semiconductor nanomaterials” (https://bit.ly/3cbCSKy). Joyce shared her experience with Wang on how to promote a good balance between a scientific career and personal life among young scientists and researchers. Although she acknowledged that balancing family life and work is a real challenge, she also recognized that it is a rewarding experience to find an equilibrium in both aspects. Joyce
remarked that it is important that everyone (managers, mentors, supervisors, postdocs, and students) recognize how hard finding balance can be and to try to be understanding of their colleagues. She mentioned her experiences on gender related factors, stating that women tend to be in the minority in STEM disciplines, which in some ways can be good because people are more likely to remember them and notice their research.

Nonetheless, Joyce said that there are still unconscious biases against women. Wang appreciated the honest advice targeted towards young professionals, particularly her thoughts on the importance of career development as much as research and accepting constructive criticism. She emphasized that feedback can be viewed as a gift that allows us to improve professionally and mentioned that she learned this much too late in her research career that she wished she had learned earlier.

Special acknowledgements go to: Sebastian Lourdudoss, Mattias Hammar and Anders Hallén from the CSW2021 organizing committee; Arne Alping and Christofer Silfvenius from IEEE Photonics Sweden Chapter and IEEE Sweden Section. The organizers are grateful for their efforts and support to ensure the success of the Women-in-Electronics & Photonics symposium at CSW2021. Such support helps the initiative lead a brighter future and open needed inclusion discussion.

IEEE Senior Member Initiative: How to Apply or Nominate in 2022

Includes Helpful Resources for Chapters & Volunteers to Encourage Applications

The ‘Nominate a Senior Member Initiative’ was designed to encourage IEEE Society Chapters and volunteer leaders to become actively involved in promoting IEEE Senior Member grade. This initiative aims to: encourage grade advancement within IEEE; simplify the application process; offer financial incentives for approved senior member applications; and offer increased member benefits. Chapters and mentors should encourage senior membership elevation for many reasons. IEEE Senior Members become more invested in volunteer activities at a leadership level and have an average retention rate of 98%.

Also, many executive volunteer boards and committees require that a member hold a minimum of IEEE Senior Member grade. The more distinguished members your chapter holds may help give your chapter a bigger voice in the community. IEEE Senior Member is the highest grade for which IEEE members can apply. IEEE members can self-nominate, or be nominated, for senior member grade. Prospective members who would like to apply directly for Senior Member grade should join the IEEE and then submit the ‘Senior Member Application Form’ as an IEEE member number is required on the senior member application. There is no additional fee to apply.

To be eligible for application or nomination, candidates must: be engineers, scientists, educators, technical executives, or originators in IEEE-designated fields; have experience reflecting professional maturity; have been in professional practice for at least ten years; show significant performance over a period of at least five of their years in professional practice.

A checklist of Senior Member eligibility guidelines and application deadlines can be found here: https://bit.ly/3oSKXZ0

Chapters are also encouraged to hold local ‘IEEE Senior Member Elevation Events’. Events where local members can receive assistance from chapter chairs and volunteer leaders in applying. Here is a helpful ‘How-To’ guide for planning and holding such events, which includes a timeline, invite templates, checklists, and more: http://bit.ly/2QiOYap

Benefits of Senior Membership

Senior Member Plaque
All newly elevated Senior Members have received an engraved Senior Member plaque to be proudly displayed for colleagues, clients, and employers to see. The plaque, an attractive fine wood with bronze engraving, is sent within six to eight weeks after elevation.

US$25 Coupon
IEEE will recognize all newly elevated Senior Members with a coupon worth up to US$25. This coupon can be used to join one new IEEE society. The coupon expires on 31 December of the year in which it is received.
Letter of Commendation
A letter of commendation will be sent to your employer on the achievement of senior member grade (upon the request of the newly elected Senior Member). Announcements: Announcement of elevation can be made in section/society and/or local newsletters, newspapers, and notices.

Leadership Eligibility
Senior members are eligible to hold executive IEEE volunteer positions. Ability to Refer Other Candidates: Senior members can serve as a reference for other applicants for senior membership.

Review Panel
Senior members are invited to be on the panel to review senior member applications. Complimentary Society Voucher: Voucher to join one new IEEE Society.

US$25 Referral Coupon
Newly elevated Senior Members are encouraged to find the next innovators of tomorrow and invite them to join IEEE. Invite them to join and the new IEEE member will receive $25 off their first year of membership.

Awards
Every year the IEEE Photonics Society awards one chapter that highly encourages member-grade advancements with their local community. The award aims to promote networking and education opportunities; encourage membership grade advancement within the society; simplify the application process for members; offer financial incentives and increased benefits for senior membership participants. The society honors the chapter with an honorarium of $200, which this presented annually at the IEEE Photonics Conference.

IEEE Photonics Society Honors Recently Elevated Senior Members
The following IEEE Photonics Society Members have been elevated to Senior Member or Life Senior Member over the last year:

- Abdel Razik Ahmed, Mohamed – Egypt
- Al-Khafaji, Hamza Mohammed
- Ridha – Iraq
- Ahmad, Raja – USA
- Andres, Miguel – Spain
- Appaiah, Kumar – India
- Ashdown, Jonathan – USA
- Ashok, Ashwin – USA
- Atakaramians, Shaghik – Australia
- Basu, Rikmantra – India
- Bejani, Micheline – UAE
- Bhutia, Kamaljit – India
- Bhatnagar, Anuj – India
- Bhattacharyya, Somak – India
- Carena, Andrea – Italy
- Chanclou, Philippe – France
- Chang, Guo-En – Taiwan
- Chen, Baile – China
- Cheng, Gary – USA
- Cho, Seongjae – Korea
- Choudhary, Armol – India
- Chum, Euclides – Brazil
- Collins, Steven – USA
- Da Ros, Francesco – Denmark
- Dahlem, Marcus – Belgium
- Deotare, Parag – USA
- Dhar, Nirib – USA
- Diaz, Andres – USA
- Diddams, Scott – USA
- Dogru, Nuran – Turkey
- Dong, Yuhan – China
- Dris, Stefanos – France
- El-Sabban, Salwa – Egypt
- Emani, Naresh – India
- Escarras Matthew – USA
- Fortuna, Seth – USA
- Friedman, Dan – Canada
- Fu, Hongyan – China
- Gerken, Martina – Germany
- Going, Ryan – USA
- Handelman, Amir – Israel
- Holsinger, Kevin – USA
- Huang, Jie – USA
- Jain, Geetika – India
- Jang, Jae-Hyung – Korea
- Jiao, Yuqing – Netherlands
- Kandpal, Kavindra – India
- Kelly, Kevin – USA
- Ketharaju, Rameshchandra – India
- Kim, Chul Han – Korea
- Kim, Sangsik – USA
- Kurokawa, Satoru – Japan
- Kyaw, Aung Ko Ko – China
- Lam, Yeeloy – Singapore
- Lee, Changhee – Korea
- Li, Jianping – China
- Li, Qian – China
- Li, Ruoming – China
- Lin, Chih-Lung – Taiwan
- Ling, Fu-Ri – China
- Liu, Huanhuan – China
- Liu, Zhao Jun – China
- Luis, Ruben – Japan
- Luo, Ai-Ping – China
- Luo, Dan – China
- Luo, Xianshu – Singapore
- M, Venkatesha – India
- Ma, Yingjie – China
- Maddila, Ravi – India
- Marsland, Robert – USA
- Metcalf, Andrew – USA
- Morozov, Oleg – Russia
- Mou, Chengbo – China
- Mullett, Gary – USA
- Munday, Jeremy – USA
- Murawski, Michal – Poland
- Nakarmi, Bikash – China
- Nguyen, Binh-Minh – USA
- Ouyang, Chunmei – China
- Pei, Yiyang – Singapore
- Peric, Dragan – Serbia
- Pintas, Paolo – USA
- Pissadakis, Stavros – Greece
- Poon, Andrew – China
- Putnam, William – USA
- Qiao, Hong – USA
- Rademacher, Georg – Japan
- Rahman, Moshen – UK
- Ravet, Fabien – Switzerland
- Raza, Kamran – Pakistan
- Renaudier, Jeremie – France
- Ryckman, Judson – USA
- S, Nandan – India
- Sarkar, Somenath – India
- Satish Malathi – India
- Schrans, Thomas – USA
- Shaik, Enaal haq – India
- Shao, Guodong – China
- Sharma, Sunny – India
- Shi, Hanxing – USA
- Shi, Yongqiang – USA
- Shigematsu, Masayuki – Japan
- Sima, Chaotan – China
- Song, Youjian – China
- Sonkar, Ramesh – India
- Stanev, Dimitar – Australia
- Sugie, Toshihiko – Japan
- Sun, Yuxu – China
- Szczepa, Krzysztof – USA
- Taira, Yoichi – Japan

38 IEEE PHOTONICS SOCIETY NEWSLETTER December 2021
Department Head—Electrical and Computer Engineering—Colorado State University

The Department of Electrical and Computer Engineering (ECE) within Walter Scott, Jr. College of Engineering at Colorado State University (CSU) is searching for an ECE Department Head to provide leadership for the 26 tenured, tenure-track, and instructional faculty, including 3 University Distinguished Professors and a University Distinguished Teaching Scholar, 25 administrative and research staff, 408 undergraduates and 159 graduate students. This is a full-time, 12-month appointment, 5-year term, tenured full-professor faculty position, reporting directly to the Dean of the Walter Scott, Jr. College of Engineering.

Applications and nominations will be considered until the position is filled; however, applications should be received by full consideration date to ensure full consideration.

Full consideration date: 1/31/2022. The desired start date for this position is July 1, 2022.

To view full posting and apply, visit: https://jobs.colostate.edu/postings/94402

CSU is an EO/EA/AA employer and conducts background checks on all final candidates.
Conferences

Conference Report: 27th International Semiconductor Laser Conference (ISLC)

Paul Crump, General Chair of the 27th ISLC
Head of Lab High Power Diode Lasers, Ferdinand-Braun-Institut, Berlin, Germany (www.fbh-berlin.de)

It’s a wrap! After years of preparation and in spite of the operating challenges from the COVID-pandemic, the ISLC returned successfully to Germany in 2021 after a 20-year pause. The conference wrapped up on 14 October, on a beautiful autumn day in the Dorint Hotel in historic Potsdam, just outside the capital Berlin. The 27th ISLC was the first hybrid event in the conference’s history and was filled to capacity, with both in-person attendance (over 100) and the in-person exhibition selling out, complemented by over 100 on-line attendees, more than matching attendance in previous years. The ISLC succeeded thanks to a huge effort by its organizers, the team at the Ferdinand-Braun-Institut, excellent support from the conference chairs, the program committee and the IEEE Photonics Society as technical sponsors as well as enthusiastic participation from the semiconductor laser community. We saw especially strong technical on-line participation from the Japanese community, even though travelling was not possible. Indeed, Program Chair Akihiko Kasukawa from Furukawa Electric, was the only in-person representative from the entire Asia-Pacific region, continuing his untiring support of the ISLC.

We had a packed program with many exciting legend-, plenary-, invited- and contributed talks, workshops and discussions in the traditional multi-topic, single-session ISLC format, including live and online poster sessions and a packed post-deadline session. The content was truly internationally organized and attended, and offered a condensed summary of progress across the whole semiconductor laser and LED field, including a first-time expanded discussion of advanced detectors. For example, in my own expert area of high-power

General Chairs of the ISLC in 2021 (Crump, Right) and next time in 2022 (Kasukawa, Left).

Aris Koulas-Simos from TU Berlin receiving his poster prize for his nice work on nanolasers.

Lively discussion in hybrid mode during David Schleuning’s Sunday Workshop on LIDAR sources.

Chairs of the ISLC in 2021, at the conference banquet. Left to right: Leisher (Americas chair), Crump (General chair), Kasukawa (Program chair) and Bente (Europe, Mid-East and Africa chair). Nobu Nishiyama the Asia/Pacific chair sadly could not attend in person.
The technology behind the hybrid conference, courtesy of our partners at Bärlin Team GmbH. Here, enabling Nobu Nishiyama’s Sunday Workshop on Advanced Photodetection.

Technical discussions during the exhibition.

Questions and answers during technical sessions.

Tour of the sights of historical Potsdam on the final day.

diode lasers, I was delighted to see strongly increased output powers and efficiencies in many different classes of devices, including THz lasers (first exceeding 1 W), PSCELs (first with 29 W continuous wave) and edge-emitters (first 1-cm bars with 2.2 kW).

In an important step, the ISLC community also took time to honor the achievements of two sadly departed eminent scientists, who both made a major contribution to the field and the ISLC itself, in a special in-memoriam session: Prof. Markus-Christian Amann (Walter Schottky Institute of the Technical University of Munich) and Prof. Peter S. Zory (University of Florida). We also recognized exciting progress by the next generation of laser scientists, with the IEEE Photonics Society’s $400 prize for the best student poster awarded to Aris Koulas-Simos from TU Berlin for his nice work on nanolasers.

In a final effort after the conference closes, ISLC authors have the opportunity to publish expanded versions of their 2021 conference presentations as articles in a special issue of the IEEE Photonics Journal on Advances in Semiconductors – deadline 4 Feb 2022, don’t forget! https://www.photonicsociety.org/images/files/publications/Call_for_Papers_in_Progress_in_Semiconductor_Lasers.pdf

Overall, it’s been an honor to serve, I’m pleased and proud of the results of all our efforts on the ISLC, and excited by the ongoing excellent progress and many opportunities in the semiconductor laser field. Now though, the conference moves on, with Akihiko Kasukawa taking over from me as General Chair for the next ISLC 2022 in Matsue, Japan: www.islc2022.org. I wish Aki and his team much success, and encourage you all to attend!
Originating in 1988, the conference on Education and Training in Optics and Photonics (ETOP) is a biennial international conference which brings together leading optics and photonics educators, researchers, and professionals from all levels to discuss, demonstrate, and learn about new developments and approaches to teaching in these fields. ETOP has four permanent co-sponsors, namely, Optica (formerly the OSA), SPIE, the IEEE Photonics Society, and the International Commission for Optics.

The most recent edition of ETOP was held on September 8–10, 2021. While originally planned to be hosted in Singapore, it was switched to virtual in lieu of the COVID-19 pandemic. Thus, this year marked the first time that ETOP was held entirely virtually. Fortunately, this enabled not only veteran attendees to participate, but also allowed new participants, whom otherwise may not have had the financial or logistical means, to join the conference. Besides the three chairs, the organizing work was supported by an international committee of 31 members from 13 countries, with an academia:industry representation of roughly 2:1. The virtual conference platform, staffing, paper management, and other administrative processes were handled by Optica, with financial support from the other permanent sponsors.

The conference featured two plenary sessions; a technical program which, along with the main oral and poster sessions, included 9 invited speakers; and a social mixer. The event drew over 180 registered attendees from more than 12 countries, with most global time zones represented. To increase access, the sessions did not follow a fixed daily schedule, but were spread out over multiple time zones. The virtual access was generally appreciated by many attendees, and there were common suggestions to consider a hybrid format for subsequent editions.

Plenary Sessions

**Carl Wieman**
*Professor, Stanford University, USA*  
2001 Nobel Laureate in Physics

**Talk:** New Insights on Teaching and Evaluating Scientific Problem-solving

Carl Wieman is known for his contributions to both physics, where he was awarded the Nobel Prize in 2001 for his and his co-winners’ work on Bose-Einstein condensates; and education, where he was awarded the 2020 Yidan Prize for pioneering new pedagogies in STEM education. His plenary lecture addressed a key and contemporary issue, that of educating STEM students to be able to solve science and engineering problems in the real world. It turns out that it sounds easier than it actually is.

He began with a look at brain research and contrasted a prevailing model, where the degree of knowledge retention is fixed for each brain and varies across brains, with a model from new research, in which any brain can learn anything through intense thinking. Here, thinking is analogous to physical exercise; proper techniques of thinking build neuron connections, just like how proper exercise builds muscle. The old advice to keep practicing applies just as well here.

Next, he went into the optics education context and highlighted that typical textbook problems, such as identifying the correct formula for a focal point calculation, or calculating the critical angle for total internal reflection in a fiber, have limited pedagogical value to prepare students to tackle “authentic” real problems, such as doubling the output power of a dye laser within a fixed financial budget, or increasing the bandwidth of a long-distance optical fiber within practical constraints. The latter problems are complex, have no obvious unique solution, and often require figuring out missing information.

To address this gap, he detailed his group’s ~7-year-long research, which included interviewing around 50 successful scientists and engineers on how they solved significant problems during their careers. A surprising discovery was that they identified 29 common decisions that were made almost across the board [1]. These decisions included answering questions like “What information is needed to solve the problem?”, “What to prioritize?”, “How believable is the data?”, and “What can & cannot be concluded from it?” The research went further to categorize the 29 decisions into a thinking framework.

From this, he outlined his group’s next and ongoing work: creating decision-based-problem-solving assessments. Tests on students and skilled practitioners revealed that consensus was achieved among the latter group, but not the former, over the various decisions. To tackle this, he dove into each of the categories comprising the 29 decisions and advised on ways to
encourage students to practice making these decisions as part of the learning process.

He concluded with a discussion of which specific decision types were the most important and the most difficult to learn, which he opined are reflective decisions. Again, regular practice is important for such learning. This rounded up an insightful journey into cutting-edge developments in pedagogy.

*Prof. Wieman has kindly made his slides available. Please contact the conference chairs for more information.

Reference

Judy Donnelly
Professor Emerita, Three Rivers Community College, USA

Nancy Magnani
Summer School District, USA

Vasudevan (Vengu) Lakshminarayanan
Professor, University of Waterloo, Canada

Talk: ETOP Retrospective: An Update

Judy Donnelly, Nancy Magnani, and Vasudevan (Vengu) Lakshminarayanan are all well-known veterans in the ETOP community. It is apt that they shared a retrospective look at the ETOP conference during the second plenary session.

They began with the geography of ETOP, showing a map of past locations. Two pertinent points were: 1) that ETOP has yet to be held in South America, Africa, or Oceania, and thus, there was an encouragement for educators from these regions to bid for future hosting; and 2) that the COVID-19 pandemic, for better or for worse, has added cyberspace to the list, given that this was the first fully virtual edition.

Next, they brought everyone down memory lane, going through each historical ETOP location since the 1988 inaugural edition in San Diego, CA, USA with SPIE and the OSA as co-sponsors. The 1997 edition in Delft, the Netherlands was the first outside the USA and the first in Europe. The 1999 edition in Cancun, Mexico was the first (and to date, the only) one in Latin America. The 2001 edition in Singapore was the first in Asia. In the 2009 edition in St. Asaph, Wales, UK, the IEEE joined as a permanent sponsor. The 2011 edition was meant to be held in Tunis, Tunisia, with Vengu as a co-chair, but due to the Arab Spring situation, it was postponed till 2012 and ultimately cancelled. The most recent physically held ETOP was in 2019 in Quebec City, Quebec, Canada, which was co-chaired by our 2021 edition co-chair, Anne-Sophie Poulin-Girard, and was co-located with the Photonics North conference.

Thereafter, they shared some interesting analytics, obtained by pouring through the ETOP papers published in the SPIE Digital Library (a total of 1,198 records). In terms of the geo-residence area of first authors, most (37%) were in North America, followed by Europe (33%), Asia (22%), Latin America (5%), and the rest of the world. The percentage of first authors from transitional and developing economies varied from 10% to 30% over the years. Regarding targeted education levels, an overwhelming majority focused on graduate/undergraduate education, with a lower proportion focusing on K–12, and a small but finite portion covering technical/vocational education and continuing education.

Since 2015, several trends were observed. Firstly, technical-level education has increasingly been represented. Secondly, there has been a dramatic increase in the number of outreach and informal education papers. Thirdly, a few emerging topics were identified, namely, active learning, teaching with technology, online education, and interdisciplinary projects. Hands-on workshops have also become a regular feature at ETOP, though it was noted that they are likely only feasible at a physical conference.

Judy and Nancy concluded the talk portion of the session by highlighting a key feature of ETOP that makes it stand out from other traditional conferences, that is, the special events. Over the now more than a dozen editions, conference
attendees have always been treated to social events that showcase the host cities’ unique cultures, from a medieval banquet in St. Asaph, Wales, UK in 2009, to Bordeaux tasting in Bordeaux, France in 2015; a spectacular nighttime water show of “Hangzhou, A Living Poem” at West Lake in Hangzhou, China in 2017 (the same show presented during the 2016 G20 Hangzhou summit); and a homely sugar shack visit with lots of dancing in Québec City, Québec, Canada in 2019. More than the cultural discovery, these events and the conference in general are regarded by many as “family reunions” for the close-knit ETOP community.

The session then moved into an informal Q&A/discussion, where various suggestions for future ETOP editions were raised and considered. As a fitting conclusion to the lively plenary, the speakers shared a memorable video of conference attendees dancing away to cultural music during the sugar shack event in Québec, perhaps a subtle expression of hope that we could soon resume these “reunions”.

Ray Davies, Photonics Academy of Wales @ Bangor: A Tribute
Presented by K. Alan Shore, Professor Emeritus, Bangor University, UK

Ray Davies is well-known in the ETOP and the broader optics education communities. He upheld a strong hands-on, challenge-based approach to learning which encouraged starting with solutions, not problems. As director of the Photonics Academy of Wales at Bangor University from 2006 to 2021, he led many successful programs, perhaps the most notable of which is the Photonics Academy Summer School (PASS). Here, around 20 upper secondary students would develop, construct, and test applied optics projects over 4 or 5 summer weeks.

He had a profound ability to engage and get anyone interested in optics. For example, he trained a team of primary school pupils to perform with light-based instruments at the St. Asaph Music Festival [2]. He regularly engaged with the ETOP community, presenting at multiple editions, including in 2015, where he elaborated on public engagement in photonics in Wales for the International Year of Light, in which he played an active role.

Ray’s passion for teaching, well into his eighties, and numerous contributions to optics and photonics education and outreach live on through the many lives he has impacted for the better.

Reference

Highlights from Technical Sessions
There were more than 80 presentations given across 14 sessions covering 9 themes, which comprised 5 regular topics and 4 special topics. The regular topics included:
1) New Methods, Tools, Kits, and Models for Photonics Education.
2) Curriculum Development and Improvement in Optics and Photonics.
3) Outreach Education in Optics and Photonics.
4) Education and Training in Multidisciplinary Environments.
5) Teaching Optics and Photonics Using New Technologies.

A poster session was also held. The special sessions addressed themes that were of particular relevance to the contemporary optics and photonics landscape. These were:

Education in Quantum Optics
As the quantum discipline gradually moves from abstract to applied, and with emerging technologies such as quantum computing, there is much recent interest in academia to develop quantum science and engineering curricula to meet the growing demand for skilled graduates. This session included updates on programs and teaching approaches to quantum optics. In an invited talk, Paula Heron from the University of Washington set the stage with a treatment on dual-process theories of reasoning, where thinking (in the context of solving problems) occurs in fast (intuitive, heuristic) and slow (reflective, analytical) phases. This model aims to more accurately understand the experiences of learners and to improve pedagogy.

An inquiry approach to learning electromagnetic waves and quantum physics was presented by Rhys Adams from Vanier College. In this project-oriented program, students reflect, raise and answer questions, and present findings on the science behind photonics-based Nobel prizes. This helps to promote “photonics awareness” and enhances the students’ ability to connect the science to everyday life.

Other presentations covered improved ways to teach quantum optics. Bahaa Saleh from The College of Optics and Photonics, University of Central Florida, and the author of the textbook “Fundamentals of Photonics”, talked about incorporating quantum information science into an optics curriculum. He carefully explained how to exploit classical-quantum congruences to introduce quantum concepts. For example, taking a matrix optics approach, students learning about polarization and the Poincaré sphere can then go further into the quantum perspective by analogously considering qubits and the Bloch sphere. In another talk, Yuriy Akimov from the Institute of High Performance Computing, Singapore, compared classical and quantum descriptions of light emission, highlighted similarities and differences, and addressed common misconceptions in the quantum domain.
Low-Cost Experiments for Higher Education

This session explored enabling learning through affordable, often home-built, kits and apparatus. The kits presented included, among others, a microcontroller-based LED current-voltage curve tracer, by Everardo Vargas-Rodriguez; an interferometer using a household mirror and a beam splitter taken from an old compact disc player, by Ana Guzman-Chavez (both from the University of Guanajuato); and a laser pointer housed in a 3-D printed assembly for demonstrating interference and diffraction, by Christopher Nakamura, Saginaw Valley State University. Besides financial cost considerations, these projects also addressed the challenge of enriching home-based and remote learning.

Clint Bennett from Ateneo de Manila University shared an unconventional program for undergraduates where they investigate special relativity, not through conventional albeit expensive optical equipment, but rather via affordable analogous op-amp-based electronic circuits. The program also provided an opportunity for students to gain research exposure and encouraged publishing their results.

Strategies and Tools for Remote Learning

Remote learning has existed before COVID-19, but the pandemic has put a spotlight on it, making it a necessity in many contexts and accelerating its large-scale adoption. This session looked at remote learning strategies for optics education. Timo Betz from Georg-August-Universität Göttingen gave an invited talk on a LEGO-based microscope design that 9-to-13-year-old students can construct at home.

Several programs were also discussed. Lukas Chrostowski from the University of British Columbia elaborated on the motivations, design, and implementation of the online edX course “Phot1x: Silicon Photonics Design, Fabrication and Data Analysis” which he developed. Matthew Posner from Excelitas Technologies Inc. spoke about challenges and key considerations made to convert a traditionally in-person educational event, the annual Montreal Photonics Networking Event, to virtual. No doubt, the points are broadly applicable to many physical-turned-virtual conferences, including this edition of ETOP.

ETOP Celebrates Holography and the 50th Anniversary of Dennis Gabor’s Nobel Prize

Dennis Gabor is credited “for the invention and development of the holographic method”, for which he was awarded the Nobel Prize in Physics in 1971. This special session was held to commemorate this milestone 50 years on, and included two parts. It began with a historical perspective, delivered by Augusto Belendez from Universidad de Alicante, going over Gabor’s early Hungarian origins, his work on improving the electron microscope, and his subsequent investigations of “hologram” interference patterns. Contributions to early holography by Yuri Denisyuk (wave photography), and Emmett Leith and Juris Upatnieks (lensless photography) were also acknowledged.

In the second part, John Sheridan from University College Dublin gave an overview of the applications of holography and holograms. He touched on holographic optical elements and noted especially that spatial light modulators and micro-electro-mechanical systems have made possible various holographic technologies such as programmable illumination, optical computing systems, and dynamic switching networks. He also spoke about how holography is modeled and how the underpinning theoretical concepts could be explained in educational settings.

Social Event—ETOP Mixer

Participants in ETOP from around the world got to know one another in a kick-off mixer on Zoom. The Zoom format allowed the hosts to randomly mix participants into small groups (breakout rooms) and many new friendships were forged this way. To facilitate discussion, the various groups brainstormed on questions such as “How can we leverage data to improve optics and photonics education?” and also discussed the merits of online education and how the future of optics and photonics education will change. In spite of the time zone differences, all continents were represented at the mixer. To organizers of other online conferences, we highly recommend a kick-off meeting in this format.

Future

Plans for the next edition of ETOP, in 2023, are already underway. While the format and location have not yet been officially fixed, the conference has been tentatively planned to be held physically in Singapore. Further details will be updated in due course. We all look forward to the next ETOP!
Asia Communications and Photonics Conference (ACP) is the largest conference in Asia-Pacific region with a focus on optical communications, photonics and optoelectronics. ACP was merged from APOC and AOE, and it has been held annually tracing back to 2001. ACP is jointly sponsored by OPTICA, SPIE, IEEE Photonics Society, COS and CIC. There were more than 800 registrations at ACP 2021, which was held in Shanghai, China. The conference venue is located at the beautiful bund of the Huangpu river.

Plenary Session
Following the ACP opening speech by Prof. Connie-Hasnain Chang, the Plenary Session took place on Monday morning, 25 October 2021. It featured four presentations by world-renowned speakers from both academia and industry. The session was presided by Prof. Ping Perry Shum from Southern University of Science and Technology and Prof. Daoxin Dai from Zhejiang University. The first speaker, Prof. Ruxin Li from ShanghaiTech University, delivered the presentation titled “The free-electron laser based on a laser accelerator”. He reported their recent ground-breaking experimental demonstration of the undulator radiation amplification in the exponential gain regime using LWFA-based electron beams. The following three online presentations were delivered by Dr. Xiang Liu from Huawei Hong Kong Research Center, Prof. Shanhui Fan from Stanford University, and Prof. Tobias J. Kippenberg from EPFL. Dr. Liu's talk, titled “Emerging Optical and Photonic Technologies for Communications and Beyond”, reviewed the global research endeavor to meet the grand technical challenges of the communication capacity limit imposed by the Shannon theorem and the slowing down of the Moore’s law, as well as the broadening application space of the optical and photonic technologies. Prof. Fan’s talk, titled “Explorations of Topological Photonics in Synthetic Dimensions”, focused on their recent inspiring theoretical and elegant experimental efforts in exploring frequency synthetic dimensions, which provides tremendous flexibilities for exploring a wide range of novel topological effects. The plenary session was concluded with Prof. Kippenberg’s talk, titled “Photonic Chip based Frequency Combs”, which reported their recent breakthroughs in optical frequency combs based on dissipative Kerr solitons. All the four presentations were very well received by the full house of onsite and online audience.

Workshop and Industry Forum
Prior to the ACP2021 technical program, the ACP2021 Workshop and Industry Forum took place on 24 October. There are 14 sessions in total to provide opportunities for both academia and industry to discuss and debate the edge-cutting technologies. Each workshop or industry forum consists of a series of short presentations from experts in the relevant field followed by a panel discussion. ACP2021 Workshop topics focus on the hot frontiers of photonic physics and a significant direction of optical technology in recent years, including microcavity frequency combs, space-division multiplexing (SDM), novel routines from fibres to transceivers, AI photonics, exploration of fibre’s ultimate transmission limit in terms of nonlinearity compensation or advanced coded modulation schemes, bio-photonic imaging roadmap 2021, heterogeneous photonic integration on silicon, co-integration of photonics and electronics, and a Light: Science & Application entitled workshop in quantum photonics. ACP2021 Industry Forum topics address more about the opportunities, challenges, innovations and solutions to the next generation optical networks from industry side, including all optical service networks, next-generation optical switching and transmission technologies for F5G and beyond, future artificial intelligence optical network toward 2030, silicon photonics integration for beyond 800G pluggable and co-packaged optics applications. All these topics featured enhanced interactions that inspired both the speakers and the audience, connected with academia and industry, and brainstormed the whole photonics community.

Postdeadline Session
The Postdeadline Session took place on Tuesday afternoon, 26 October, featuring 10 talks out of a total of 31 submissions to
the 7 conference tracks, covering selective topics in the general fields of optical communications, integrated photonics, microwave photonics, and sensing. All these presentations were very impressive. For example, Ruowei Yu, et al. from Fudan University presented a smart and elegant multicore fiber reverse-tapering technique for the construction of a fused taper type fan-in and fan-out device with excellent overall performance. Among the innovative and solid experimental demonstrations of optical transmission technologies, Xiang Li, et al. from University of Cambridge remotely presented their bidirectional symmetric 100-Gb/s/λ coherent PON using a simplified ONU transceiver, featuring only 3-dBm LO power and >30-dB power budget with 50-km reach. The session also hosted presentations on smart and novel beam steering demonstrations, among which, Zihan Zang, et al. from Tsinghua University proposed and demonstrated a low-cost diffractive element to achieve wide-angle, two-dimensional, and complex-mode beam steering, breaking the limitations in field of view and flexibility for conventional beam steering by spatial dispersion. Throughout the entire session, the audience were quite interested by the high-quality presentations on top-notch research and interacted actively with the speakers in the Q&A time.

Best Student Paper Award
The ACP2021 Best Student Paper Award competitions took place on 25 and 26 October. 25 finalists were selected to present their papers to the competition committee and audience in a special conference session. All these presentations were very impressive, and 8 prize winners received the awards and the certificates at the conference Banquet. In the hot area of optical combs, Chun Wang et al. from University of Electronic Science and Technology China presented a mode-locked fiber soliton laser comb using Raman amplified asymmetric Kelly radiation. Hao Hu et al. from Huazhong University of Science and Technology showed a high performance parametric spectro-temporal analyzer assisted by a soliton microcomb. In the integrated photonics field, Long Zhang et al. from Zhejiang University reported a new-generation ultra-low loss silicon multimode photonic waveguide and devices, and in the optical transmission part, Xinyu Chen et al. from Peking University experimentally demonstrated a 240-Gbaud SSB OOK transmitter with a 120-GSa/s DAC. Xiaomin Liu et al. from Shanghai Jiao Tong University explored the grey-box model for estimating nonlinear SNR in optical networks using physics guided neural networks. All the shortlisted students gave high-quality presentations of their research with confidence, and well interacted with the audience and committee members.

Student Events
Since 2018, IEEE photonics society sponsored student events such as mentor/mentee pairings, “how to write and review paper” and python hackathon have added into the ACP program. Two student events were present and reformatted this year to cope with the pandemic as many international professionals couldn’t attend the conference in-person. The 1st event is named “Wechat Study Group” designed to help students expand their professional networks while talking with the peers working at similar topics during the conference. Five study groups covering the optics from photonic integration to optical networks were formed and maintained by student volunteers. We hope to keep the study groups as a long-term study and information exchange platform.

The 2nd event was scheduled into two sessions where in total 13 international industry leaders and distinguished researchers from China Mobile, Alibaba, Kaushou Technology, OFS laboratories, Microsoft, Bytedance, University of Cambridge, Huawei, Nokia Bell Labs, ADVA, AIST, NICT and IMEC were invited to give a 10-minute either on-site or on-line presentation to address the questions such as key factors in personal career development, major differences between research in a career and in industry and how to achieve a successful transition from a researcher to a manager. Invited senior professionals who work abroad also shared their overseas living experience and provided valuable information about abroad study and research opportunities to the students.
2D barcodes for joining in each WeChat study group.

Dr. Nan Ye from Shanghai University and Dr. Bin Chen from Hefei University of Technology co-chaired the event on-site and facilitated a lively Q&A session with stimulating discussion. Feedback collected from the students who attended the event in-person:

Mengfan Fu (from Shanghai Jiaotong University, SJTU): In the ACP student event, several leaders and researchers introduced their labs and shared their experiences with us, which inspired me a lot. They also provided some suggestions about how to be a good engineer or researcher, from which I benefited a lot. In addition, we also had a chance to communicate with peers. I really enjoyed this event!
Ruihuan Zhang (SJTU): I would like to thanks the invitees very much for their selfless and detailed sharing. They let me know that interest is the most important thing when we need to make a choice, and then we should keep loving and sticking to it to make a success.

Yetian Huang (Shanghai University, SHU): It’s my honor to attend this Student Event with the outstanding invitees. From their experiences and insights, an excellent researcher should be willing to be open, inclusive, innovate and keeping learning. They also told us that the most important thing in research is interest and maintaining love, as well as the courage to try.

Hanzi Huang (SHU): I am very grateful and honored to have the opportunity to hear from and interact with industry leaders and distinguished researchers in photonics and optical communication industry at the ACP 2021 Student Events. I am deeply impressed by the professional spirit and determined desire to benefit human society displayed by the high-level professionals in attendance and I note that they are extremely pleased to help students and young researchers to develop their careers. Many thanks to the organizers for this wonderful event!

Jie Wang (Tianjing University, TJU): Through this student event, I learned about the career paths of some outstanding industry leaders, and got a lot of meaningful suggestions about my future career path choices or further study. It has provided great help for my future career development.

Weicheng Chen (TJU): I learned about the career development paths of some distinguished researchers and excellent industrial talents during the student event. These extremely valuable experiences will greatly contribute to my future career development.
**SAVE THE DATE**

**RAPiD**

Research and Applications of Photonics in Defense

12-14 September 2022
Miramar Beach, FL USA
www.ieee-rapid.org

**IPC**

The Annual Conference of the IEEE Photonics Society

13-17 November 2022
Vancouver, BC Canada
www.ieee-ipc.org
Publications


Scope description:
This JLT Special Issue covers topics in the field of integrated photonics for emerging quantum applications such as communications, computing, networking, sensing, and metrology and aims to provide researchers and students with the newest developments in these rapidly evolving fields. We welcome submissions that highlight recent advancements in photonic integrated circuits and/or their integration into systems and sub-systems for quantum applications. The scope of this special issue includes, but is not limited to, the following:

- Chip-scale single photon, entangled photon, and squeezed light sources
- Light sources for quantum applications
- Quantum frequency converters
- Quantum transducers
- Single and photon number resolving detectors for quantum applications
- Coherent detectors for quantum applications
- Fiber or integrated photonic waveguides for quantum applications
- Integrated quantum photonics in various platforms
- Novel photonic structures for efficient quantum devices
- Quantum memories/Quantum repeaters
- Integrated photonics for quantum key distribution systems and networks
- Integrated photonics in support of other qubit modalities (ions, solid state color centers, etc...)
- Material progress for photonic structures
- Hybrid approaches to photonic interfacing of qubits
- Integrated photonics for quantum computing

The Guest Editors for this Special Issue are: Fotini Karinou (Microsoft Research Ltd, UK), Cheryl Sorace-Agaskar (MIT Lincoln/US), Jin Liu (Sun Yat-Sen University/China), Volker Sorger (George Washington University/US), Galan Moody (UCSB/US), Eleni Diamanti (CNRS/Europe), Kartik Srinivasan (NIST and Joint Quantum Institute/US), Di Zhu (IMRE, A*STAR/Singapore), Benjamin Pingault (Harvard University/US and Delft Technical University/EU).

Submission Deadline: March 31, 2022
Publication: Nov/Dec 2022 issue

Unedited preprints of accepted manuscripts are normally posted online on IEEE Xplore within 1 week of the final files being uploaded by the author(s) on ScholarOne Manuscripts. Posted preprints have digital object identifiers (DOIs) assigned to them and are fully citable. Once available, the preprints are replaced by final copy-edited and XML-tagged versions of manuscripts on IEEE Xplore. This usually occurs well before the hardcopy publication date. These final versions have article numbers assigned to them to accelerate the online publication; the same article numbers are used for the print versions of JLT.

For inquiries, please contact:
IEEE Photonics Society JLT Editorial Office – Douglas Hargis, Email: d.hargis@ieee.org

The following documents located at http://mc.manuscriptcentral.com/jlt-ieee are required during the mandatory online submission.
• PDF manuscript (double column format, up to 10 pages for an invited paper, up to 8 pages for a contributed paper). Manuscripts over the standard page limit will have an overlength charge of $260.00 per page imposed. Author biographies and photographs are optional.
• See the Tools for Authors link:
  www.ieee.org/web/publications/authors/transjnl/index.html
JLT uses the iThenticate software to detect instances of overlapping and similar text in submitted manuscripts and previously published papers. Authors should ensure that relevant previously published papers are cited and that instances of similarity are justified by clearly stating the distinction between a submitted paper and previous publications.
Announcing an Issue of the IEEE JOURNAL OF SELECTED TOPICS IN QUANTUM ELECTRONICS on
**High Density Integrated Multipurpose Photonic Circuits**

Submission Deadline: February 1, 2022
Hard Copy Publication: November/December 2022

The IEEE Journal of Selected Topics in Quantum Electronics (JSTQE) invites manuscript submissions in **High Density Integrated Multipurpose Photonic Circuits**. The emerging field of **programmable photonics** is one of the fastest growing fields in photonics with applications including optical signal processing, computing and quantum photonics. The growing maturity of integrated photonic technology makes it possible to build increasingly large and complex photonic circuits on the surface of a chip, enabling a generation of photonic circuits that can be programmed using software for a wide variety of functions. Within this framework, the IEEE Journal of Selected Topics in Quantum Electronics invites manuscript submissions in the area of **integrated programmable photonics**. The purpose of this issue of JSTQE is to highlight the recent progress and trends in developing leading-edge large-scale integrated optics technologies. Areas of interest include (but are not limited to):

- **Novel reconfigurable circuit and system architectures focused on high-performance and scalable circuits.**
  - Large-scale feedforward waveguide mesh arrangements and their applications.
  - Large-scale general-purpose waveguide meshes and their applications / Field Programmable Photonic Gate Arrays.
  - Reconfigurable photonic integrated circuits and their applications (Coupled resonators, Reconfigurable multiplexer, optical switches...)
  - Reconfigurable systems enabling mode, polarization, and wavelength multiplexing.
  - Large-scale photonic integrated circuit packaging for dense electrical and optical interconnections.

- **Advanced component design focused on large-scale integration: monitoring, phase actuators and fault tolerant components.**
  - Alternative phase tuning mechanisms.
  - Phase change materials.
  - Novel design, fabrication and packaging techniques for scalable building blocks.

- **Advanced programming and control routines.**
  - Complex circuit modelling.
  - System reconfiguration and stabilization algorithms.
  - Control system architectures.

The Primary Guest Editor for this issue is **Dr. Daniel Pérez-López**, Photonics Research Labs, Universitat Politècnica de Valencia, Valencia, Spain. The Guest Editors are: **Dr. Alexander Tait**, NIST, USA; **Dr. Leimeng Zhuang**, Baraja, USA.

The deadline for submission of manuscripts is **February 1, 2022**. Hardcopy publication of the issue is scheduled for **November/December 2022**.
Call for Papers

Announcing an Issue of the IEEE JOURNAL OF SELECTED TOPICS IN QUANTUM ELECTRONICS on Nonlinear Integrated Photonics

Submission Deadline: April 1, 2022
Hard Copy Publication: January/February 2023

The IEEE Journal of Selected Topics in Quantum Electronics (JSTQE) invites manuscript submissions in Nonlinear Integrated Photonics. The field of Nonlinear Integrated Photonics has opened up new horizons in optical signal processing, quantum technologies, and sensing by leveraging the strong light-matter interactions available at the nanoscale. The ample functionality enabled by nonlinear optical effects, combined with the potential for dense integration and high-speed low-power operation of nanophotonic devices, has turned this field in one of the most thriving scientific areas. The IEEE Journal of Selected Topics in Quantum Electronics invites manuscript submissions in the area of Nonlinear Integrated Photonics. Areas of interest include (but are not limited to):

- **Progress on nonlinear integrated optical sources**
  - Integrated frequency combs, mode-locked lasers, and supercontinuum sources and their applications in telecommunications, data centers, and sensing
  - Microcavity Brillouin lasers and on-chip Raman lasers
  - THz-sources on nonlinear integrated platforms

- **Advances on nonlinear integrated photonics for quantum applications**
  - Nonlinear integrated photonics for quantum sources such as heralded single-photon generation, entangled photon-pairs generation, and squeezed states of light.
  - Spectral translation of quantum light in $\chi^{(2)}$ media, periodically poled $\chi^{(2)}$ media, and $\chi^{(3)}$ media
  - Quantum photon-photon interactions in integrated platforms towards quantum-by-quantum control, all-optical deterministic quantum logic, single-photon switches and transistors

- **Nonlinear optical effects in novel material platforms and structured media**
  - Progress in on-chip nonlinear novel material platforms: Titanium dioxide, (thin film) lithium niobate, (ultra)silicon rich nitride, silicon carbide, and others.
  - Nonlinearity-enhancement using metasurfaces, plasmonics, graphene-loaded waveguides, and others.
  - Nonlinearities in topological and PT-symmetric nanophotonic structures

- **Nonlinear optics applications in telecommunications, data centers, and sensing**

The Primary Guest Editor for this issue is Dr. Andrea Blanco-Redondo, Nokia Bell-Labs, USA. The Guest Editors are: Prof. Dawn Tan, Singapore University of Technology and Design, Singapore; Dr. Christian Grillet, CNRS/École Centrale de Lyon, France; Dr. Bryn Bell, Imperial College London, U.K.

The deadline for submission of manuscripts is April 1, 2022. Hardcopy publication of the issue is scheduled for January/February 2023.
Announcing an Issue of the IEEE JOURNAL OF SELECTED TOPICS IN QUANTUM ELECTRONICS on Optical Computing

Submission Deadline: June 1, 2022
Hard Copy Publication: March/April 2023

The IEEE Journal of Selected Topics in Quantum Electronics (JSTQE) invites manuscript submissions in Optical Computing. We are witnessing a renaissance in the research of photonic computing driven by the demands of artificial intelligence and neuromorphic computing on current digital electronic hardware (which has a central processor and separated memory for sequential processing). Optical physics could enable non von Neumann computing i.e., a massively distributed architecture for parallel processing, and potentially enable new applications that require low latency, high bandwidth and low energies; for example, high-performance computing, solving optimization problems, accelerating deep learning, quantum processing, etc. The progress in this field is driven by the advances in photonic integration and a large-scale semiconductor manufacturing ecosystem. However, making a practical optical processor will require continued progress in new materials, devices, hardware architectures, software and simulation tools, and packaging techniques. This special issue will cover the current status, prospects, and challenges of the field in using light for neuromorphic computing, machine learning, and quantum information processing. The IEEE Journal of Selected Topics in Quantum Electronics invites manuscript submissions in Optical Computing. Areas of interest include (but are not limited to):

- Materials for photonic computing including Si, SiN, 2D material heterostructures, phase-change materials, ITO, LNOI etc.
- Attojoule photonic nonlinear devices
- Photonic memory, analogue memory, in-memory computing, volatile and non-volatile memories
- Photonic neural network architectures (layered or recurrent, spiking, or continuous time); free-space and integrated.
- Photonic reservoir computing
- Optical Ising machines
- Hardware algorithms
- Cryogenic photonic neural networks
- Light sources (quantum dots, laser integration, frequency combs)
- Photonic data converters (photonic DACs)
- Active on-chip electronics and CMOS co-integration
- Packaging techniques and solutions
- Photonic circuit design (methods, tools); photonic compilers

The Primary Guest Editor for this issue is Prof./Dr. Bhavin Shastri, Queen's University, Canada. The Guest Editors are: Dr. Bert Jan Offrein, IBM Research Europe – Zurich, Switzerland; Dr. Xing Lin, Tsinghua University, China; TBA

The deadline for submission of manuscripts is June 1, 2022. Hardcopy publication of the issue is scheduled for March/April 2023. Unedited preprints of accepted manuscripts are normally posted online on IEEE Xplore within 1 week of the final files being uploaded by the author(s) on ScholarOne Manuscripts. Posted preprints have digital object identifiers (DOIs) assigned to them and are fully citable. Once available, the preprints are replaced by final copy-edited and XML-tagged versions of manuscripts on IEEE Xplore. This usually occurs well before the hardcopy publication date. These final versions have article numbers assigned to them to accelerate the online publication; the same article numbers are used for the print versions of JSTQE.

For inquiries, please contact:
IEEE Photonics Society JSTQE Editorial Office - Chin Tan Lutz (Email: c.tanlutz@ieee.org)

The following documents located at http://mc.manuscriptcentral.com/jstqe-pho are required during the mandatory online submission.

1) PDF manuscript (double column format, up to 12 pages for an invited paper, up to 8 pages for a contributed paper). Manuscripts over the standard page limit will have an overlength charge of $220.00 per page imposed. Biographies of all authors are mandatory, photographs are optional. See the Tools for Authors link: www.ieee.org/web/publications/authors/transjnl/index.html.

JSTQE uses the iThenticate software to detect instances of overlapping and similar text in submitted manuscripts and previously published papers. Authors should ensure that relevant previously published papers are cited and that instances of similarity are justified by clearly stating the distinction between a submitted paper and previous publications.
Renew Membership:
Get Benefits Through the End of 2022

Stay on the cutting edge of photonics as an IEEE Photonics Society Member.

Remember to renew your IEEE Photonics Membership to continue to
develop your career and access educational networking tools.

Already an IEEE Member?
Current IEEE Members can receive a higher grade Society membership
with a new reduced member rate of $20 USD and $10 USD for students.

>>> Renew Today: www.IEEE.org/Renew

Get Connected, Stay Informed:
PhotonicsSociety.org
PhotonicsConferences.org
Facebook.com/PhotonicsSociety
Twitter: @IEEEPhotonics
ADVERTISER’S INDEX
The Advertiser’s Index contained in this issue is compiled as a service to our readers and advertisers. The publisher is not liable for errors or omissions although every effort is made to ensure its accuracy. Be sure to let our advertisers know you found them through the IEEE Photonics Society Newsletter.

Advertiser . . . . . . . . . . . . . Page #

NextCorps . . . . . . . . . . . . . . . . . .3
Optiwave . . . . . . . . . . . . . .Cover 4
Santec . . . . . . . . . . . . . . . .Cover 2

IEEE Photonics Society Newsletter
Advertising Sales Offices
445 Hoes Lane, Piscataway NJ 08854

www.ieee.org/ieemedia
Impact this hard-to-reach audience in their own Society publication. For further information on product and recruitment advertising, call your local sales office.

Aviva Rothman
Project Manager
Naylor Association Solutions
352-333-3435
arothen@naylor.com

Photonics Society Mission Statement
Photonics Society shall advance the interests of its members and the laser, optoelectronics, and photonics professional community by:

• providing opportunities for information exchange, continuing education, and professional growth;
• publishing journals, sponsoring conferences, and supporting local chapter and student activities;
• formally recognizing the professional contributions of members;
• representing the laser, optoelectronics, and photonics community and serving as its advocate within the IEEE, the broader scientific and technical community, and society at large.

Photonics Society Field of Interest
The Society’s Field of Interest is lasers, optical and photonic devices, optical fibers, and associated lightwave technology and their systems and applications. The society is concerned with transforming the science of materials, optical phenomena, and quantum electronic devices into the design, development, and manufacture of photonic technologies. The Society promotes and cooperates in the educational and technical activities which contribute to the useful expansion of the field of quantum opto-electronics and applications.

The Society shall aid in promoting close cooperation with other IEEE societies and councils in the form of joint publications, sponsorships of meetings, and other forms of information exchange. Appropriate cooperative efforts will also be undertaken with non-IEEE societies.

Do you like what you’re reading? Your feedback is important. Let us know—send the editor-in-chief an e-mail!
Breakthroughs in the generation of light and in its control and utilization have given rise to the field of Photonics, a rapidly expanding area of science and technology with major technological and economic impact. Photonics integrates quantum electronics and optics to accelerate progress in the generation of novel photon sources and in their utilization in emerging applications at the micro and nano scales spanning from the far-infrared/THz to the x-ray region of the electromagnetic spectrum.

The IEEE Photonics Journal welcomes original contributions addressing issues ranging from fundamental understanding to emerging technologies and applications.

The Journal includes topics in:

- Optical Communications
- Fiber Optics Devices and Subsystems
- Light Sources
- Detection, Sensing, and Energy
- Fabrication and Materials
- Plasmonics and Metamaterials
- Biophotonics and Medical Optics
- Computational Photonics
- Propagation, Imaging, and Spectroscopy
- Quantum Photonics
- Nonlinear Photonics and Novel Optical Phenomena
- Optical Data Science and Machine Intelligence in Photonics

The high standards of editorial quality and peer review that you expect from a Photonics Society journal!

Average time-to-publication on IEEE Xplore is 7 weeks

ISI Impact Factor: 2.833

Online Submission System via ScholarOne

2021 Open Access Pricing:

<table>
<thead>
<tr>
<th>Pages</th>
<th>15% Discount Society Member Rate</th>
<th>15% Discount IEEE Member Rate</th>
<th>15% Discount Non-Member</th>
</tr>
</thead>
<tbody>
<tr>
<td>Up to 6 Pages</td>
<td>$1,037</td>
<td>$1,159</td>
<td>$1,220</td>
</tr>
<tr>
<td>7-10 Pages</td>
<td>$1,547</td>
<td>$1,729</td>
<td>$1,820</td>
</tr>
</tbody>
</table>

$125 per page over 10 pages, no member discounts on overlength

Special Circumstances: IEEE offers discounts for unemployed, minimum income and the permanently disabled.

To learn more and submit a paper, visit: www.photonicsjournal.org
Facilitate testing and characterization of photonics integrated circuits!

Leverage the power of automation in lab and manufacturing

OptiInstrument, developed by Optiwave in collaboration with EXFO, is an easy-to-use visual programming software that enables the automation of test and measurement tasks on EXFO’s test platforms (LTB and FTB series).

EXFO’s LTB-12 rackmount modular mainframe

OptiInstrument’s single window, intuitive GUI,

Key features:
- User-friendly graphical user interface (GUI) to build and run automation scripts
- Convert test sequences to Python language
- Save and view results of executed SCPI commands in various formats

User-friendly | Lab-ready | Scalable

Click here for a 30-day free trial of OptiInstrument