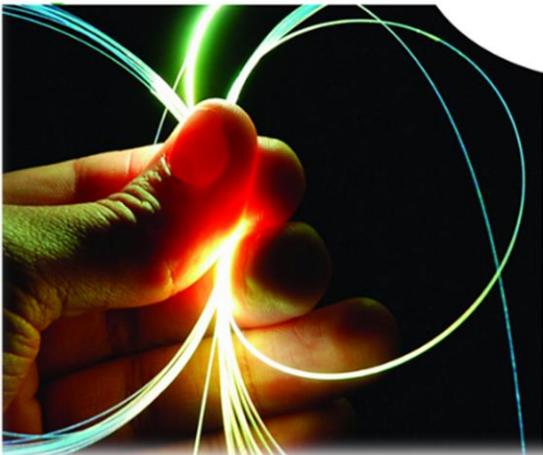


International
School on

Light

Sciences and
Technologies



2019 Core: Light in Sources, Health and Medicine

FINAL REPORT



DIRECTOR:

José Miguel López Higuera

*Professor in Electronics and Photonics
Head of the Photonic Engineering Group
University of Cantabria
e-mail: lopezhjm@unican.es*



SECRETARY

Adolfo Cobo García

*Professor
Photonics Engineering Group
University of Cantabria
e-mail: adolfo.cobo@unican.es*



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International School on Light Sciences and Technologies (ISLiST)

June 17-21, 2019, Santander, Spain

Core: *Light in Sources, Health and Medicine*

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International School on Light Sciences and Technologies (ISLiST)

June 17-21, 2019, Santander, Spain

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1.- EXECUTIVE SUMMARY

This International School has been conceived as a great opportunity to review, actualize and improve the knowledge of *scientists, professionals and technicians*; to contribute to the education and to enhance the motivation of *PhD students*; to offer an ideal frame for *networking* and also to contribute to the education of common citizens. It is also a great opportunity to ensure that policymakers, entrepreneurs, and other key “actors” will be aware of the problem-solving potential of Photonics.

ISLiST is envisioned to be a worldwide top International forum on *Light Sciences and Technologies* in the framework of a “special university” that is recognized as the “university of universities”. It runs (the third or fourth week of June of every year) in a privileged environment “the Royal Magdalena Palace” in Santander, Cantabria, Spain. Each edition of this international school will have an intensification or main core in a specific application area and additional current hot topics. **Light in Sources, Health and Medicine** was the core of this 2019 edition.

More than 70 attendees from 13 nationalities and from more than 25 different institutions gathered in the week of June 17 to 21, 2019, in Santander, Spain to receive the knowledge and experience from 15 of the most reputable professors and professionals (all Drs) of the most reputable academic and research institutions and companies of 10 different nationalities.



Figure 1.- General View of the Royal Palace of the Magdalena, venue of ISLiST.



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The ISLiST participants (60% PhD students and 30% female) had the privilege to receive the teachings and experience of researchers of the stature of the laureate with the 2018 Nobel Prize in Physics, Donna Strickland, and of professors, Rod Taylor, Luis Roso, Aydogan Ozcan, Susana Marcos, Sune Svanberg, Michael Hamblin, Katarina Svanberg, Mark Hutchinson, Laura Lechuga, Kishan Dholakia, Walter Margulis, Robert Huber and JM López-Higuera. They also received the experience of reputable professionals such as Dr. Jan W. Denneman (Honorary Ambassador of the Global Lighting Association) and also from Dr. Pere Pérez-Millán (Co-founder and CTO of Fyla Lasers). Very hot topics in the use of light sciences and technologies in sources, health and medicine were presented and discussed along of the 16 one-hour lectures and two round tables that focused on the search for challenges pending both in light sources (round table I) and in the use of Light in the Health and Medicine sectors (round table II).

Sponsored by the Santander Council (Ayuntamiento de Santander), the ISLiST attendees enjoyed the Santander Council Reception, a great opportunity to share experiences and an optimum occasion for networking.

During the International School of Sciences and Technologies of Light, Professor Strickland (OSA Fellow) was awarded with the Julio Peláez Prize and also invested Doctor Honoris Causa by the UIMP acting, in this last ceremony, Professor López-Higuera (OSA Fellow) as her godfather.

To be able to reach this 2019 ambitious program, this International School of UIMP was supported by several sponsors: Gobierno de Cantabria, Fundación ACS, the Optical Society, OSA and Equipos Nucleares S.A. (ENSA), Fyla Lasers and Prysman.

It has also been supported by several collaborators such as: Santander Council, AMBAR Telecommunications, B-Phot Brussels Photonic Team, SPIE-the International Society for Optics and Photonics, SEDOPTICA; OZ Optics, ERZIA, Semicrol, CIBER-BBN, Colegio de Médicos de Cantabria, Hotel Santemar and the Photonics Engineering Group of the University of Cantabria. Without these Sponsors and collaborators, this top quality school and the grants for international students would not have been possible. The UIMP, the direction of this event and the scientific community using Light are grateful with the generosity of all these Organizations and all the Invited Speakers. **Thank you so much!**

At the end of the closing ceremony, the next edition of this international school was announced. The fifth edition of ISLiST (June 22-26, 2020) will have the core on **Light in Energy and Advanced Manufacturing. Nobel Laureate in Physics 2018, Gerard Mourou** will be the Opening Invited Speaker

Santander, November 11, 2019.



Prof. José Miguel López-Higuera
Director ISLiST at UIMP



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2.- ISLIST-2019: A SUCCESSFUL AND TRULY INTERNATIONAL SCHOOL

ISLIST at UIMP has been acknowledged as a high standard international meeting by the invited scientists and professionals and as well as by the attendees. It has been considered as an edition with an excellent organization, where high quality services were offered, where cutting-edge ideas and technologies were presented and discussed and where networking and interchange of experiences were also successfully carried out (see satisfaction-survey).

The participants of this first edition of the ISLIST at UIMP in Santander, Spain, enjoyed the Sixteen (16) invited talks and two round tables by highly renowned professors and researchers from the most prestigious worldwide institutions of Europe, USA, and Australia, as well, presidents of the most reputed international Photonic Scientific Organizations. The hot topic of *Light in Sources, Health and Medicine* was the core of this 2019 edition.



Figure 2. Family photo of the ISLIST-2019 participants. It was taken just before the Santander Council reception. Around, Invited Speakers and organizers.



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2.1 ISLIST 2019: Some data

More than 70 attendees from 13 different nationalities (from over 25 different institutions) participated in this meeting. As shown in the geographical breakdown in Figure 3, more than 30 participants came from Spain, 8 from Poland, 6 from India, 5 from China, 3 from Iran, Mexico and Italy, 2 from Lithuania and USA, Russia; 1 from Nigeria, Morocco, Brasil and Perú participated in the School.

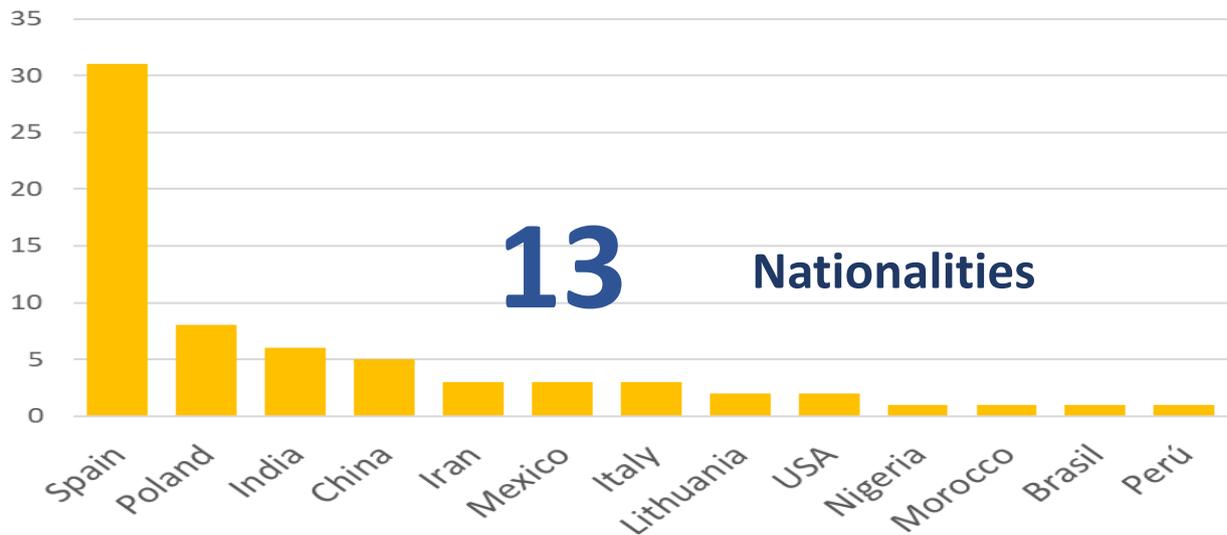


Figure 3.- ISLIST attendees by countries from Europe, Asia, America and Africa.

Eighty-two per cent (82%), twelve (12%) and six (6%) of participants were from education institutions (Universities), R&D centers and companies, respectively.

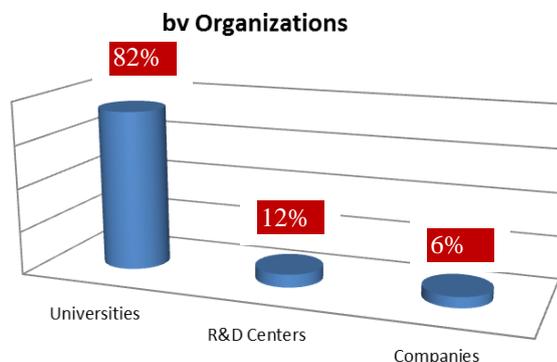


Figure 4.-Attendees by Organizations.



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PhD students: 60%

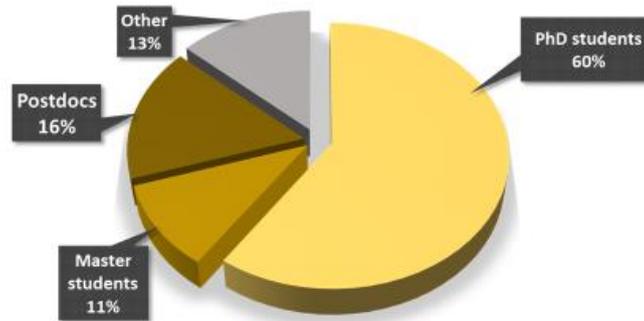


Figure 5.-ISLiST attendees by education

Regarding the previously mentioned students: 60% were PhD students, 16% were PhD (Dr), 11% were Master Students (figure 5).

In terms of the participants age: 74% of the attendees were in the range from 20 to 30 years, which is in correlation with the fact of the education period working towards PhD degrees and also in Post-docs. This fact suggests the very good acceptance of this top quality school and its positive potential impact on the education of very good researchers and professionals in the early stages of their careers. This fact will be key issue for the near future of our globalized world in which this key technology (Photonics) will play as relevant roll as Electronics played in the last XX Century. 22% of the attendees were in the range from 31 to 35 and 12% were attendees of more than 41 years old respectively.

Attendees age distribution:

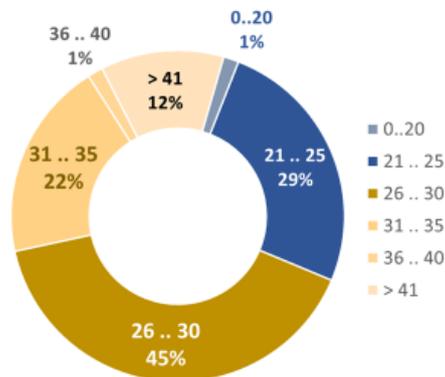


Figure 6.-ISLiST attendees by age.



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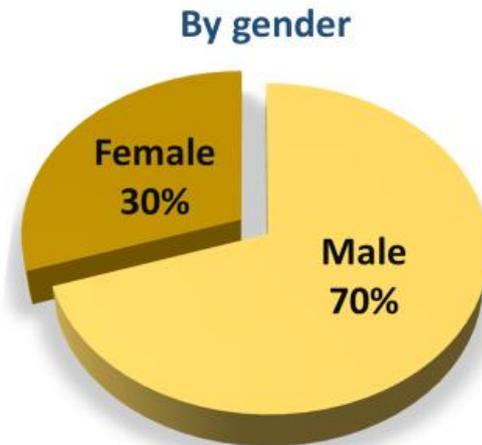


Figure 7.- ISLiST attendees by gender

Analyzing the gender distribution, the 70% of the attendees were men and the 30% women, that in comparison with the gender distribution of the previous ISLiST editions [2017 (74% attendees were men and 26% women) and ISLiST 2018 (67% attendees were men and 33% women)] represents a little decrease of the gender gap. This is in same way in correlation with the real situation in many countries in technical and scientific job positions. Taking in consideration the number of women as students in grade levels of the current education institutions, these numbers will be progressively change towards a more homogeneous distribution without the need of any specific policy, just fighting against any kind of discrimination. In any case, what really will help to decrease this gap are policies facilitating the familiar real conciliation lives of the families with very special emphasis in the younger ones.

For Spanish Students or Students of any nationality but working/studying in Spanish institutions, UIMP offers grants with funds provided by Spanish State. However, UIMP is not able to offer grants for any other international Students. Thanks to the sponsors and collaborators, ISLiST was able to offer grants for **international** students from non-Spanish institutions. <http://www.teisa.unican.es/ISLiST/index.php/grants>

A call for applications was opened for two kinds of student grants: i) Registration Grants or ii) Full Grants that cover course registration, accommodation and living expenses.

A total of 60 grants were allocated (25 funded by the Spanish state and 35 using the funds form the sponsors and collaborators). 45 were complete or full grants (35 for international students) and 15 covered the school registration fee.



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Figure 8.-ISLiST Student Grants distribution

The International School on Light Sciences and Technologies (ISLiST) at the Menéndez Pelayo International University (UIMP), Spain, has consolidated as an international reference at the highest scientific and technical level.

It is confirmed on the fact of the highest quality of the lectures of the best experts (including the **2018 Nobel Prize in Physics, OSA Fellow, Donna Strickland**) of the most renowned institutions and organizations in the world in the use of Light Sciences and Technologies in Sources, in Health and Medicine, together with the numerous and high qualification of international participants. In this regards, as it happened in the previous editions of ISLiST, the offer of scholarships to international students (from any institution around the world) has significantly contributed to the achievement of the recognition of ISLiST as a top international forum, what is "inscribed in the genes" of this very special **University of Universities** (the International University Menendez Pelayo, UIMP).



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3.- PROGRAM AND ITS DEVELOPMENT

The School Programme was designed and published in the meeting web site. The program and notebook were included in the bag of all the ISLIST participants:

https://www.teisa.unican.es/ISLIST/images/2019/ISLIST_2019_final_program.pdf

The general Schedule of ISLIST-2019 was programmed and developed as shown in figure 9.

General Schedule					
Time	Monday 17 th	Tuesday 18 th	Wednesday 19 th	Thursday 20 th	Friday 21 st
9:30		Prof. Donna Strickland Nobel Prize in Physics 2018 University of Waterloo, Canada <i>From nonlinear Optics to High-Intensity Laser Physics</i>	Prof. Sune Svanberg Director, Lund Laser Center, Atomic Physics Division, Lund University, Sweden <i>Fighting antibiotic resistance and food safety using light based techniques</i>	Prof. Kishan Dholakia Director, School of Physics & Astronomy, University of St. Andrews, Scotland, UK. <i>Optical Manipulation on Medicine Tasks</i>	Prof. Kishan Dholakia Director, School of Physics & Astronomy, University of St. Andrews, Scotland, UK <i>Wider, faster, deeper: new perspectives on imaging at depth</i>
10:15	Opening Remarks				
10:40	Break	Break	Break	Break	Break
11:00	Prof. Aydogan Ozcan Director, BioNano-Photonics Laboratory, Chancellor's Professor, University of California, Los Angeles, USA <i>Toward a Thinking Microscope: Deep Learning-enabled Computational Microscopy and Sensing</i>	Prof. Rod Taylor Head, Femtosecond Optics Group, Imperial College of London, UK <i>Fiber based light Sources: from the UV to the mid infrared</i>	Prof. Michael Hamblin Principal Investigator, at Wellman Center for Photomedicine and Harvard Medical School, Boston, USA <i>The healing power of photobiomodulation or low-level light therapy (LLLT)</i>	10:50 Prof. Walter Margulis Senior Scientist, RISE-ACREDO, Guest Prof. at ETH Royal Institute of Technology, Stockholm, Sweden <i>Flow Cytometry using Optical Fibre technologies</i>	Prof. Robert Huber Head, of the Biomedical Imaging and Laser Technology Group, University of Jülich, Germany <i>Imaging the tissue structure: advances on Optical Coherence Tomography</i>
12:10	Prof. Susana Marcos Director, Visual Optics and Biophotonics Lab, Instituto de Óptica, Professor of Research, CSIC <i>"Light in the Diagnosis and Therapy of the Vision human system"</i>	Prof. Luis Roso Director, Spanish Center for Pulsed Lasers, CLPU, Salamanca, Spain <i>Petawatt lasers and their potential applications in Biomedicine</i>	Prof. Katarina Svanberg Director, Medical Laser Centre, Lund University, Sweden <i>Early tumor detection using Light and its fighting using Photodynamic Therapy (PDT): What next for extensive use in clinic?</i>	12:00 DHC ceremony Donna Strickland Nobel Laureate	12: 15 Closing Remarks, ISLIST-2019 Announcement and Diploma Delivery
13:30	Lunch	Lunch	Lunch	Lunch	
15:00					
15:30	Prof. JM López-Higuera Head, Photonics Engineering Group, University of Cantabria, CIBER-BBN and IDIVAL, Spain <i>Light on Health and Medicine</i>	Round Table I: Optical Source challenges <i>Prof. Donna Strickland</i> <i>Prof. Rod Taylor</i> <i>Prof. Luis Roso</i> <i>Dr. Pere Pérez-Millán</i> Moderator: JM López-Higuera	Prof. Mark Hutchinson Director, Centre for Nanoscale Biophotonics, The University of Adelaide, Australia. <i>Towards quantification of pain using light based approaches</i>	15:45 Round Table II: Light in Health & Medicine challenges <i>Prof. Katarina Svanberg</i> <i>Prof. Michael Hamblin</i> <i>Prof. Sune Svanberg</i> <i>Prof. Mark Hutchinson</i> <i>Prof. Robert Huber</i> Moderator: JM López-Higuera	
16:40	Dr. Jan W. Dennenman Founder, GoodLight Group / Honorary Ambassador of the Global Lighting Association <i>"Light, you need it!". Semiconductor LED and intelligent lighting sources: Recent advances and their impact on mood and health</i>		Prof. Laura Lechuga Head, Nanobiosensors and Bioanalytical Applications Group, ICN2, CSIC, CIBER-BBN and BIST, Barcelona, Spain <i>Nano/micro-Biosensors using Light sciences and technologies</i>		
17:55		17:20 Julio Peláez Prize ceremony Donna Strickland	Family Photo Santander City Council Reception		

Figure 9.-ISLIST-2019 General Schedule

The ISLIST-2019 Speakers are also shown in the figure 10.

ISLIST 2019 Invited Speakers



Figure 10.-ISLIST-2019 Speakers (by apparition order).



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3.1 Invited Talks and Round Tables in the frame of ISLIST-2019

After the Opening Ceremony, from June 17 to June 21, 2019, 16 keynotes and invited talks and two Round Tables were developed.



Figure 11.-Moment of the Opening Keynote by Prof. Aydogan Ozcan (UCLA).

Prof. Aydogan Ozcan (OSA Fellow, SPIE Fellow, IEEE Fellow) along their very impressive opening talk provided an overview of some of the recent work on the use of deep neural networks in the advancement of computational microscopy; In a perfect marriage between advanced optical microscopy hardware with artificial intelligence concepts and big data, state-of-the-art microscopes with self-diagnostic capability (automated diagnosis) of great applicability in medical diagnosis will be achieved, he said.

Prof. Ozcan opening keynote can be watched at the UIMP-TV website:

https://www.uimptv.es/video-2717_iv-international-school-on-light-sciences-and-technologies-core-light-in-sources-health-and-medicine-ii.html



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Prof. **Susana Marcos** (OSA Fellow) showed the new lines that are followed to treat and control myopia, restore accommodation in presbyopia or stop corneal diseases that threatens eyesight; all based on the fact that optical and photonic technologies allow a better understanding, quantification and diagnosis of eye diseases, as well as new therapies based on light.

<https://www.uimptv.es/video-2723-iv-international-school-on-light-sciences-and-technologies-core-light-in-sources-health-and-medicine-iii.html>



Figure 12.- Prof. Marcos (CSIC, Spain) during her invited talk.



Figure 13.- Prof. Lopez-Higuera (University of Cantabria, Spain) during his lecture.

Prof. **López-Higuera**, spoke about what should be understood as Light Sciences and Technologies (Photonics) and, very briefly, summarized some key properties of Light and reviewed some key doctrinal conceptions to understand the use of light approached in health and medicine. Then, he illustrated the wide potential of light in diagnosis, treatments, pharmacy, regenerative medicine etc. with very significant cases. The lecture concluded by showing trends of the use of light in health and medicine along the XXI Century.

<https://www.uimptv.es/video-2733-iv-international-school-on-light-sciences-and-technologies-core-light-in-sources-health-and-medicine-iv.html>

There is scientific evidence that light, in addition to being important for vision, also exerts significant influences on the so-called "non-visual effects" of light such as the biological rhythms of humans, their sleep, mood, functioning, etc. Most people work, study, buy, etc. in an indoor environment, where light levels are generally good enough to see, but they are much lower and of a very different quality from the natural daylight where humans evolved. And, it is estimated, that it may not optimize the development of vital parts (such as the brain) as well as the execution of human activities.

Dr. Denneman introduced the concept of "nutritional light" and defended the need for a "daily intake" considering its impact on the mood and health of human beings.

<https://www.uimptv.es/video-2732-iv-international-school-on-light-sciences-and-technologies-core-light-in-sources-health-and-medicine-v.htm>



Figure 14.- Dr. Denneman (GoodLight Group / Honorary Ambassador of the Global Lighting Association, Netherlands)



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Figure 15.- Nobel Laureate in Physics 2018, Prof. Donna Strickland (University of Waterloo, Canada) during her Invited Keynote

Professor Strickland, OSA Past President, after a series of preliminary comments on the differences between non-linear optics and the physics concerned to achieve high intensity lasers, described the research that was awarded by the Nobel Prize, (the CPA development) justifying the reasons why the aforementioned research was carried out, as well as the enormous impact it has had for the achievement of ultra-intense and ultra-short lasers; She concluded by showing very relevant examples already achieved and their possibilities in future applications with great impact on the biomedical sector.



Figure 16- Prof. Taylor (Imperial College of London, UK) during his lecture.

Professor Taylor reviewed the processes involved in the generation of radiations of enormous spectral bandwidth ("supercontinuum"); He also described and discussed highly efficient sources, based on fiber-stimulated Raman and its frequency doubling, as well as the parametric generation that allows a wide tuning capacity at average powers of several watts; He concluded his lecture with examples of its great applicability in medicine.

https://www.uimptv.es/video-2724_iv-international-school-on-light-sciences-and-technologies-core-light-in-sources-health-and-medicine-vi.html



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Figure 17.- Prof. Roso (University of Salamanca, Spain) during his lecture.

Petawatt lasers and their applications in medicine were the subject addressed by **Professor Roso**, who defended their potential use in radiotherapy on the basis that radiation is administered at once, delivering dose rates at least one million times greater than with a conventional system; however, he warned that currently is, in practical terms, at the starting state of the development of ion accelerators using ultraintense and ultrafast lasers. He insisted on the work towards the

achievement of proton accelerators by means of laser technologies that make laser proton therapy possible in future.

More about:

https://www.uimptv.es/video-2725_iv-international-school-on-light-sciences-and-technologies-core-light-in-sources-health-and-medicine-vii.html

During the Round Table I on Challenges on Light Sources both the attendees and the invitees enjoyed a very interesting round table with very active participations from both sides. After the presentation by the moderator each of the invited panellists presented their brief statement on their previously allocated topic: **Prof. Donna Strickland** on, *Challenges faced during the path towards high intensity lasers*; **Prof. Rod Taylor**, on *Challenges on Broadband fiber laser sources for medicine*; **Prof. Luis Roso**, on *Challenges on Petawatt and ultrafast lasers* and **Dr. Pere Pérez-Millan**, Director, on *Challenges to face a successful innovation process towards a Fiber laser small company*.

Then, each member of the panel took the opportunity to debate different aspects among the panelists. After that, attendees asked different questions, in an open and fully-freedom-environment, and a very interesting debate took place inside the room. Numerous interactions were carried out among the panelists and from the attendees and also discussions were established from both sides. After two and half hours, the round table concluded with several open questions and also with very interesting and useful insights and conclusions.



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Figure 18.- Round Table I; Challenges on Light Sources with special emphasis on Medical applications. From left to right hand: Pere Pérez, Roy Taylor, Donna Strickland, Luis Roso and JM López-Higuera. Courtesy of Photonics Engineering Group.



Figure 19.- Panelists' moments during the round table I development



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Figure 20.- Prof. Sune Svanberg (Lund Laser Center, Lund University, Sweden) during his Invited talk.

Professor Sune Svanberg reviewed and discussed ongoing works to combat antibiotic resistance and improve food safety using light-based techniques; He mentioned that laser spectroscopy can provide important tools in a variety of areas of great importance for human well-being; He also added that these techniques can be used to non-intrusively monitoring the gas content in food and food packages. [https://www.uimptv.es/video-2729-iv-international-school-on-light-sciences-and-](https://www.uimptv.es/video-2729-iv-international-school-on-light-sciences-and-technologies-core-light-in-sources-health-and-medicine-viii.html)

[technologies-core-light-in-sources-health-and-medicine-viii.html](https://www.uimptv.es/video-2729-iv-international-school-on-light-sciences-and-technologies-core-light-in-sources-health-and-medicine-viii.html)

Professor Michael Hamblin reviewed and discussed the healing power of FotoBioModulation (PBM) or low intensity light therapy, stating that it activates/influences through various mechanisms in antiapoptosis, antioxidant enzymes, heat shock proteins, anti-inflammatory cytosines, phagocyte M2 phenotype; He insisted that PBM has been used to improve tissue healing, to relieve pain, inflammation and swelling; He also stated that there is evidence that sudden events, degenerative diseases and psychiatric disorders can be treated by applying the PBM that could even be used for cognitive improvement in normal healthy people, he added. <https://www.uimptv.es/video-2730-iv-international-school-on-light-sciences-and-technologies-core-light-in-sources-health-and-medicine-ix.html>



Figure 21.- Prof. M. Hamblin (Wellman Center for Photomedicine and Harvard Medical School, Boston, USA) during his Invited talk.



Figure 22.- Prof. Katarina Svanberg (Medical Laser Centre, Lund University, Sweden) during his Invited talk.

Professor Katarina Svanberg, reviewed and discussed her work related to the clinical experience and translation efforts of photodynamic therapies and early detection of malignant tumors; She mentioned that, based on laser-induced fluorescence, tumors of only several cell layers can be visualized before structural morphological changes appear in later stages and also that photodynamic therapies are a modality of localized therapy whose good clinical results have already been demonstrated through its use in thousands of non pigmented malignant skin tumors; She added that, to overcome the limited penetration due to the attenuation of light, it can be inserted inside the human body through optical fibers which has a special interest where there are no other options, such recurrent prostate cancer after having been treated with ionizing radiations, she added. <https://www.uimptv.es/video-2731-iv-international-school-on-light-sciences-and-technologies-core-light-in-sources-health-and-medicine-x.html>



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Figure 23.- A sample of the interesting and, sometimes, deep discussions occurred after the invited presentations. Questions and discussions among the invitee lecturers and also with the attendees, in a fully freedom university environment, but observing the due courtesy, are the common way of behave.



Figure 24.- Prof. Mark Hutchinson (Centre for Nanoscale BioPhotonics, The University of Adelaide, Australia) during his Invited talk.

Professor Hutchinson surprised attendees by commenting on research works leading to the quantification of pain using approaches based on light technologies; He summarized recent studies in this field and reported on the complexity and how powerful will be the visualization and detection of the "other brain" through light science and technologies (and related ones) by enabling the acquisition of new knowledge to help understand and quantify the "persistent pain" and the influence of medications on it.

https://www.uimptv.es/video-2741_iv-international-school-on-light-sciences-and-technologies-core-light-in-sources-health-and-medicine-xi.html

Professor Lechuga (OSA Fellow) reviewed the state of the art in nano/microbiosensors using light sciences and technologies; She argued that portable devices for the "Point of Care" for patients and biosensors (based on the aforementioned technologies) will be a milestone for achieving higher levels of health by benefiting a majority of citizens, as well as walking towards higher levels of environmental protection.

https://www.uimptv.es/video-2742_iv-international-school-on-light-sciences-and-technologies-core-light-in-sources-health-and-medicine-xii.html



Figure 25.- Prof. Laura Lechuga (Nanobiosensors and Bioanalytical Applications Group, ICN2, CSIC, CIBER-BBN and BIST, Spain) during her Invited talk.



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Prof. Dholakia (OSA Fellow) focused his interventions on optical manipulation in medical tasks and also on new perspectives for obtaining medical images in greater tissue depths. In his first talk, he reviewed the use of optical tweezers, OT, its fundamental physics and biomedical studies; He described and showed how the optical tweezers can be trapped, moved, manipulated, etc. micrometric sized particles (and even biological material and atoms) without any physical contact; He stressed that the optical tweezers are a powerful and elegant application of the optical dipoles or gradient force in action exerted by the duly concentrated light that was first proposed by Arthur Ashkin in the mid-80s that has finally been recognized with the award of the Nobel Prize in Physics in 2018. In his second talk, he described the routes to obtain wide-field images, at greater depths, with higher resolutions and minimizing light-induced damage to biological tissues. https://www.uimptv.es/video-2743_iv-international-school-on-light-sciences-and-technologies-core-light-in-sources-health-and-medicine-xiii.html ; https://www.uimptv.es/video-2747_iv-international-school-on-light-sciences-and-technologies-core-light-in-sources-health-and-medicine-xvi.html



Figure 26.- Prof. Kishan Dholakia (SUPA, School of Physics & Astronomy, University of St Andrews, Scotland, UK) during one of his Invited talks.



Figure 27.- Prof. W. Margulis (RISE-ACREO; Guest Prof. at KTH Royal Institute of Technology, Stockholm, Sweden) during one of his Invited talk.

Professor Margulis (OSA Fellow) reviewed and discussed the work towards flow cytometry using fiber optic technologies. He mentioned that systems based on fiber optic technology can be built to trap cells and identify them by their spectral “fingerprint”. The microstructured fibers can also be used to aspirate cells of interest into them in the lateral holes for later in vitro analysis and potentially also in vivo and, also, that the separation of bacteria and the injection of substances for the treatment of cancer are additional uses of such fiber systems in medical applications, he added. https://www.uimptv.es/video-2744_iv-international-school-on-light-sciences-and-technologies-core-light-in-sources-health-and-medicine-xiv.html

Prof. R. Huber discussed the advances in optical coherence tomography (OCT) for the achievement of representative images of the internal structure of tissues. He focused on discussing the physics behind the FDML and its use for the achievement of Megahertz-OCT (MHz-OCT) technology in general (as engines that can obtain, process and display more than 4 billion voxel elements per second) and its most recent applications of virtual and augmented reality in medicine. https://www.uimptv.es/video-2748_iv-international-school-on-light-sciences-and-technologies-core-light-in-sources-health-and-medicine-xvii.html



Figure 28.- Prof. R. Huber (Biomedical Imaging and Laser Technology Group, University of Lübeck, Germany) during one of his Invited talk.



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During the Round Table II on Challenges to face on Light in Health and Medicine the participants experienced a very interesting round table with very active participations from both sides. After the presentation by the moderator each of the invited panellists presented their brief statement on their previously allocated topic: Prof. **Katarina Svanberg**, Chairperson on *Challenges to face to include PDT as a current clinical treatment*; Prof. **Michael Hamblin**, on *Challenges on LLLT real clinical applications*; Prof. **Sune Svanberg**, on *Challenges in using light based techniques in beating the antibiotic resistance and in food quality monitoring*; Prof. **Mark Hutchinson**, on *Challenges on Translational Biophotonics to Quantify Brain Health* and Prof. **Robert Huber**, on *Challenges on OCT clinical applications*.

Then, each member of the panel took the opportunity to debate different aspects among the panelists. After that, attendees asked different questions, in an open and fully-freedom-environment, and a very interesting debate took place inside the room. Numerous interactions were carried out among the panelists and from the attendees and also discussions were established from both sides. After two and half hours, the round table concluded with several open questions and also with very interesting and useful thoughts and conclusions.



Figure 29.- The panelists during the round table on Challenges on Light in Health and Medicine: Profs. Hutchinson, Sune Svanberg, Katarina Svanberg, Humbling, Huber and López-Higuera (coordinator).



Figure 30.- The panelists and coordinator during moments of their interventions.



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3.2 Some moments during the talks and free times



31.- several moments along the week.



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Figure 32 Current and productive discussions after each presentation



Figure 33.- Environment of the cafeteria during free time and breaks.





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4 Special Events

Within the frame of ISLiST, four special events took place: The Santander Council Reception, the Julio Peláez Prize, the Honorary Doctorate ceremony and an interview.

4.1 Santander Council (Ayuntamiento de Santander) Reception



The Santander Council was very pleased to offer to ISLiST attendees a special Reception. It was a great opportunity to chat, to do networking and to share experiences, enjoying with snacks and drinks inside an incredible nice environment in the Royal Hall at Magdalena Palace.



Figure 35.- Welcome words from the Rectora of UIMP Dña Maria Luz Morán, the chancellor of Santander Council Dña Gema Igual, welcoming the ISLiST participants and also from Prof. López-Higuera (Director of ISLiST) addressing some acknowledging to the Santander Council for their collaboration to reach the objectives of this International School.



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Figure 36.- ISLIST 2019 Family Photo including university and Santander Council Authorities





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Figure 37.- ISLiST participants on the Royal Hall terrace at the Magdalena Palace enjoying moments of socialization and networking during the Santander City Council Reception.



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4.2.- Julio Peláez Prize

The 2018 Nobel Prize in Physics Donna Strickland has received on Tuesday June 18, the Medal of Honor of the Julio Peláez Award to the Pioneers of Science, during an prize ceremony that took place at the Menéndez Pelayo International University (UIMP), within the IV International School on Light Sciences and Technologies.

The Julio Peláez Medal of Honor is awarded for the first time this year by the Tatiana Pérez de Guzmán el Bueno Foundation, which has created this recognition to make visible the work of women in the international field in science. In addition, this time also aims to highlight the condition of Strickland pioneer, being the third woman to receive the Nobel Prize in Physics since its creation in 1901.

The event was attended by the president of the Foundation, Teodoro Sánchez Ávila, who has presented the Prize; the Vice Chancellor for Scientific Dissemination and Exchange, María del Mar Hernández; the president of the jury that has awarded the prize, Paqui García; and the winner herself, who has been "very grateful" and Katarina Svanberg (Prof. Invited at ISLiST) who did a semblance about the honoree.



Figure 38.- The president of the jury that has awarded the prize, Paqui García- Caballero and Katarina Svanberg during their presentations.

The president of the jury stressed that it is "essential" to give visibility to these women whose work has been "crucial", as well as to recognize their "courage and perseverance" to serve as a "model" for the new generations.

He has also commented on the difficulties that women have when they start in this area, and has insisted that despite the fact that discrimination is being reduced, it still exists in some countries.



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Figure 39.- The President of the Foundation, Teodoro Sánchez Ávila delivering the medal and certificate to the prize recipient, Donna Strickland.



Figure 40. Donna Strickland during her works of thanks

In her award reception speech Strickland has highlighted the work of women in science and technology. She has recognized that “society is advancing in equality, but it does it slowly, and recalled that in his country -Canada- only 15 percent of engineers are women. Thus, he said that although not all women have to like science, *at least they have to have the opportunity to devote themselves to it*”.

Finally, the Vice Chancellor Mar Martínez, thanked the work of visibility of women's work to the Tatiana Pérez de Guzmán el Bueno Foundation and recognized the pioneering work in physics of Donna Strickland, who won the Nobel Prize for her method of generating the shortest and most intense laser pulses created by mankind.



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Figure 41.- The Vice Chancellor for Scientific Dissemination and Exchange, María del Mar Hernández; president of the Foundation, Teodoro Sánchez Ávila; the Honoree, Donna Strickland; Katarina Svanberg (Prof. Invited at ISLiST) and the president of the jury that has awarded the prize, Paqui García- Caballero.



Figure 42.- The Chancellor of UIMP, Maria Luz Moran, Teodoro Sánchez Ávila, Donna Strickland, Katarina Svanberg and, Paqui García-Caballero.



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4.3 Exceptional Event: Doctor Honoris Causa Ceremony

To recognize her very relevant contributions to the sustainability and the advance and of the mankind by inventing the *method for generating high-intensity, ultra-short optical pulses* (for which, 33 years later, was awarded with the Nobel Prize in Physics), the Menendez Pelayo International University, UIMP, recognized Prof. Donna Strickland with its Honorary Doctorate. She received this prestigious distinction in a solemn ceremony held in the Royal Hall at the end of the morning of the fourth day (June 20, 2019) of the International School on Light Sciences and Technologies. This International prestigious institution (university of universities) conferred this honorary doctorate to Prof. Strickland by agreement of its Governing Council.



Figure 43. Rector of University of Cantabria, Rector of UIMP and General Secretary of UIMP.



Figure 44.- Donna Strickland accompanied by her "goofather" enters the royal hall

In his "laudation-speech", Prof. Lopez-Higuera, Nakamura's Godfather at the Ceremony, made a revision of the scientific, technical entrepreneurial profiles of the honored and concluded:

"Our honoree is a renowned scientist who perceive herself as an athlete of physics, who enjoys directing her strengths to discover the unknown, always willing to take nothing for granted, to return to the principles to eliminate misconceptions, capable to work with joy and passion alone or in group and developing her own

intuitions in order to achieve the established objectives".



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Figure 45. Two moments of the Godfather (“padrino”) laudatio speech.



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...and continued... *"She constitutes an irrefutable demonstration that, with clear objectives, values, effort, dedication, tenacity and intelligence, success can be achieved. This makes Prof. Strickland, who is honored today, an exceptional reference for the new generations of young people of our world. She is a scientist who was able to harmonize her family with her professional lives, feeling treated as equal throughout her career and enjoying equal opportunities. She has been able to contribute to the advancement of science and technology by "paving" the path towards the achievement of the ultrashort and more intense pulsed lasers that humanity has never achieved. These devices are modifying the paradigms of light-matter-interaction and have made possible a multitude of new applications. Conveniently focused, these lasers reach extreme intensities capable of ionizing any atom, as well as extremely accelerating electrons and ions (including protons).*

She is a scientist recognized for the significant impact of her pioneering work for which she was awarded the Nobel Prize in Physics 2018. This, circumstantially, places her as the third woman who receives this prize, in their history. She has also been recognized by being elected, by the international scientific community working in photonics, President of The Optical Society OSA (2013), one of the main scientific optical societies in the world.

So, taking in consideration all these facts, dignified authorities, I kindly request, with all consideration and strong support, that Professor Dr. Donna Strickland be awarded with the supreme degree of Doctor Honoris Causa by the Menendez Pelayo International University and be, today, incorporated to its cloister of doctors.



Photo by Juan Manuel Serrano and Esteban Pérez-Cobos

Figure 46.- Three moments of the ceremony in which the Rector of the UIMP Maria Luz Morán, in presence of the Godfather invested Donna Strickland as Doctor Honoris Causa (DHC).



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Figure 47.- The honored (two moments) during his acceptance speech.

...in his acceptance speech the Honored started:

"I am deeply honoured and grateful to be awarded with a Honorary Doctorate from the Universidad Internacional Menéndez Pelayo. I would like to thank Prof. Maria Luz Morán, Chancellor and the Government Council of the University, for supporting my nomination, and Professor José Miguel López-Higuera for his kind Laudation Speech about me"....

During his speech, Strickland, who appreciated this recognition and reviewed his professional and personal career, stressed that, with his experience, he advises students not to back down from the challenges. «Do not be afraid to take on challenges». «You just have to make sure that it is what you really want to do. If you don't know, trust your friends to make that decision, she said.



Figure 48.-The UIMP Rector (Prof. Moran) during her closing DHC ceremony speech.

..... The UIMP Chancellor, María Luz Morán, stressed that Donna Strickland represents what the UIMP means: *«a combination of academic talent, research power and dissemination of their knowledge»*. *"It is possible to be an excellent researcher and a normal and smiling person,"* he said in reference to the scientist....

And the UIMP Chancellor continued by saying... we consider "a privilege" to have had Professor Strickland teaching a classic school of the summer programming of the UIMP and an "honor" to have made her Doctor Honoris Causa, the highest academic concession in the field of research, she concluded.



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Figure 49.-The honored with and JM López-Higuera (Honoree-Godfather) during the UIMP Rector Speech.



Figure 50. UIMP Governing Council, Rector of University of Cantabria and the godfather moments before the DHC Ceremony.



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4.4.- Interview to Prof. Strickland

During the ISLiST at UIMP, an interview to the Nobel Laureate **Donna Strickland** was conducted and realized by the Director of the event before to be invested DHC. It can be checked by visiting YouTube: <https://www.youtube.com/watch?v=sDwCIG-Tq0E>



Figure 51. Donna Strickland during the interview (upper) and with JM López-Higuera (bellow).



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5.- Opening, Closing remarks and Diploma Delivery

The opening ceremony was presided by the Vice-Chancellor of the International University Menendez Pelayo Dña. Mar García Hernández, who welcomed all participants to the event and stated that ISLIST international School is envisioned to be a worldwide top International forum (**every three or fourth week of June**) on *Light Sciences and Technologies* in Santander, Spain. She also spoke about the general vision and mission of UIMP.



Figure 52.- UIMP Vice-Chancellor and ISLIST Director during the Opening Ceremony.

The IV ISLIST Director, Prof. López Higuera spoke on the relevant role of Light Sciences and Technologies (Photonics) in the XXI century. Then he justified the creation of ISLIST in the frame of UIMP that runs the third or fourth week of June of every year with different core. Then he presented the panel of top level international invited speakers for the IV ISLIST edition with the core Light on sources, health and Medicine. Then he introduced the schedule of activities planned to develop ISLIST 2019.

He also added that ISLIST has been conceived as a great opportunity to review and actualize knowledge in this Key or Essential science and technology for the development of nations. It offers a great opportunity to contribute to the education of citizens and to ensure also that policymakers are made aware of the problem-solving potential of Photonics.



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The ISLIST director explained how the School was planned to be developed along the week including the special and exceptional events included in the programme. He presented also the statistics concerning the participants on the school and concluded with acknowledgement words for the Sponsors and Collaborators with special thanks to all the Invited Speakers selected among the world-wide leader authorities in their respective matters. He added special mentions to the secretary of the course Adolfo Cobo and to his secretary Maria Ruiz, both at University of Cantabria and to Margarita Montes (UIMP).

During the Closing Ceremony the ISLIST director remarked the satisfaction for the high quality of the ISLIST international school and its splendid development, concluding his Closing Speech with the confirmation of the continuation of this international School in next years.



Figure 53.-The Secretary (Prof. Cobo) and the School Director during the Concluding Remark and announcement of the ISLIST 2020.

Prof. López-Higuera announced that the fifth International School on Light Sciences and Technologies next year will have the Main Core on **Light on Energy and Advanced Manufacturing**. It will be developed during the week of June 22-26, 2020 with the stellar participation of the **Nobel Laureate in Physics 2018 Gerard Mourou**.

After the closing ceremony a personalized Official Diploma was delivered to the participants that attended the school.



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Figure 54.-Sample of ISLiST-2019 attendees receiving the diploma from four ISLiST professors.



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6.- QUALITY: SATISFACTION SURVEY

To have an objective index of quality, after closing the ISLiST international School a brief and anonymous survey was carried out online by the participants. The questions asked were:

Q1-Please indicate your overall opinion regarding the quality of the invited speakers

- | | |
|---------------|----------------|
| 0 - Very Poor | 3 - Good |
| 1 - Poor | 4 - Very good |
| 2 - Average | 5 - Excellent! |

Q2-Please indicate your overall opinion regarding the topics of the talks

- | | |
|-----------------------------|------------------------------------|
| 0 - Extremely uninteresting | 3 - Interesting |
| 1 - Not very interesting | 4 - Very Interesting |
| 2 - Average | 5 - Really what I was looking for! |

Q3-Please indicate your overall opinion regarding the ORGANIZATION of the school

- | | |
|---------------|----------------|
| 0 - Very Poor | 3 - Good |
| 1 - Poor | 4 - Very good |
| 2 - Average | 5 - Excellent! |

Q4-Please indicate your overall opinion regarding the INFORMATION that you received before attending the school

- | | |
|---------------|----------------|
| 0 - Very Poor | 3 - Good |
| 1 - Poor | 4 - Very good |
| 2 - Average | 5 - Excellent! |

Q5-Would you attend future editions if possible?

- | | |
|---------------------|--|
| 0 - Not at all | 3 - If the main core suits me |
| 1 - Not very likely | 4 - Probably |
| 2 - Maybe | 5 - I would love to come again to Santander and attend ISLiST-XX |

Q6-Would you recommend ISLiST to other colleagues?

- | | |
|---------------------|------------------------------------|
| 0 - Not at all | 3 - If the main core suits him/her |
| 1 - Not very likely | 4 - Probably |
| 2 - Maybe | 5 - Absolutely! |

Q7-Finally, did the school meet your expectations?

- | | |
|--|---|
| 0 - No, it was a complete disappointment | 3- Yes, but it might have been better |
| 1 - Not really | 4 - Yes, absolutely |
| 2 - Only partially | 5 - It was even better than I expected! |

Q8-Please, tell us about the best things of the school (what we should go on considering in future editions)

Q9-Please, tell us about the worst things of the school (what we should NOT consider in future editions)

Q10-Do you have any suggestions, comments ...?



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After receiving the responses, the overall results of the survey are graphically summarized as follows:

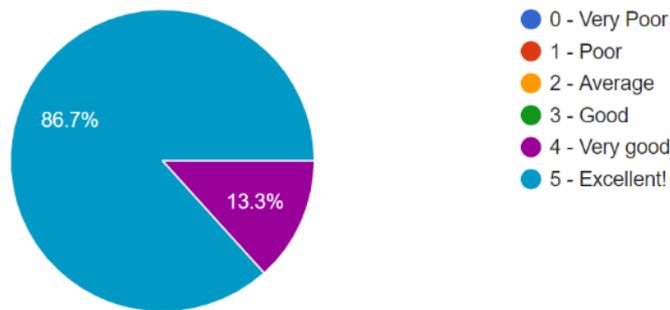


Figure 46.-Regarding the **quality of the invited speakers** (Q1), the **86,7 %**, the **13.3 %** of the participants considered that they were **excellent**, and **very good** respectively. There were no answers qualified as average, poor or very poor.

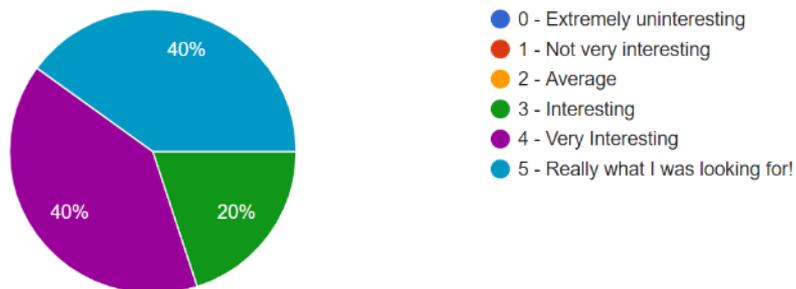


Figure 47.- Regarding the **topics of the talks** (Q2), the **40%**, the **40%** and the **20%** and of the participants considered that they were **Really it was what I was looking for**, **very interesting** and **interesting** respectively.

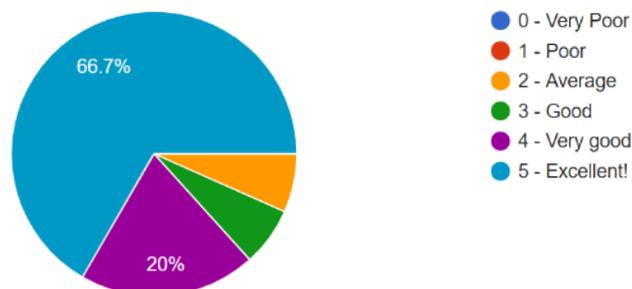


Figure 48.-Regarding the **organization of the School** (Q3), the **66,7 %**, the **20 %** and the **4.33 %** of the participants considered that they were **excellent**, **very good** and **good** respectively. There were no answers qualified as average, poor or very poor.



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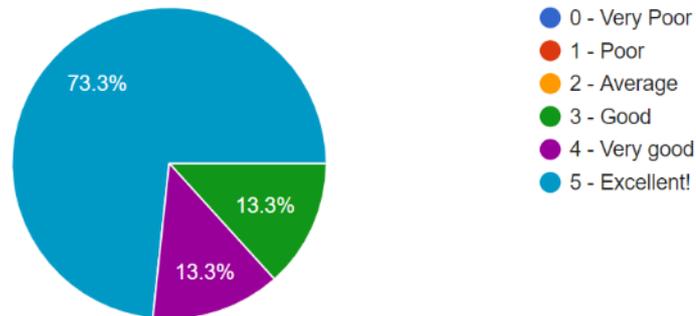


Figure 49.- Regarding the **information received before attending the School (Q4)**, the **73.3 %**, the **13,3 %** and the **13,3 %** of the participants considered that they were **excellent**, **very good** and **good** respectively.

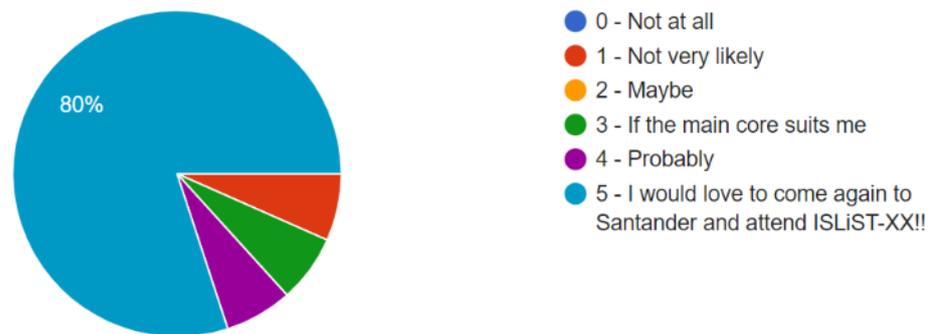


Figure 50.-Regarding the **possibility of attending the next edition of the School (Q5)**, the **80 %**, the **6.6%** and the **6.6 %** of the participants considered that they were **that they would love to come again**, **If the main core suit they**, **probably**, and **maybe (6.6 %)** respectively.

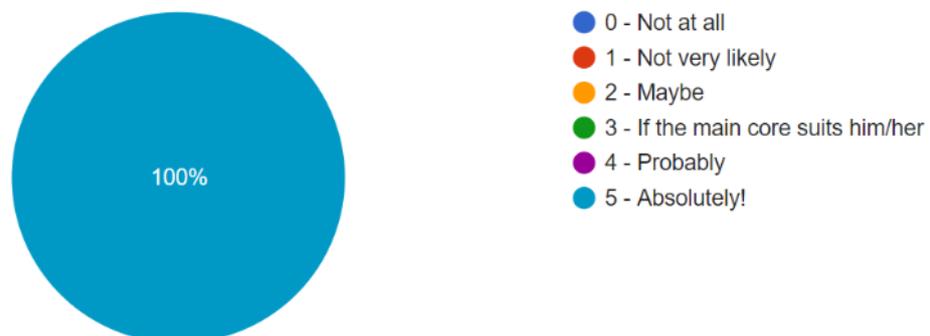


Figure 51.-Concerning **if they would recommend ISLiST to other colleagues (Q6)**, the **100 %** will recommend the school to other colleagues.



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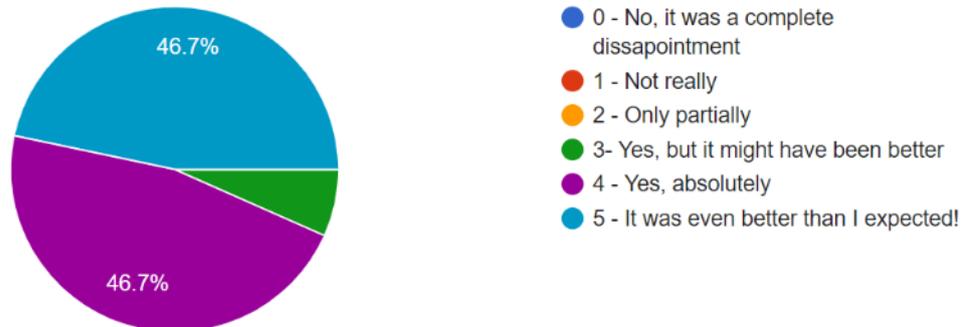


Figure 52.-Concerning **if the ISLiST meet your expectations** (Q7), the 46,7%, the 46,7%, and the 6,6% of the participants considered that: yes *absolutely*, it was even better than they expected and yes, but it might have been better respectively the school meet their expectations.

Concerning the three additional questions (Q8, Q9 and Q10), we have received the following (they are as they have been received):

Q8-Please, tell us about the best things of the school (what we should go on considering in future editions):

- Quality if students over quantity.
- The place is beautiful and the organization was really good.
- high profile invited speakers, interesting topics, having a specific core subject for the summer school.
- The opportunity to meet a nobel prize
- Highly productive research lectures
- presentatations
- It was nicely organized with full punctuality. Very nice interactions with highly expert professors. The best thing was the interaction with Nobel Laureate Donna strickland.
- The speakers selection and he quality of the lectures.
- Quality of speakers, great venue, availability of grants for international students
- I think one of the best things of the school this year is that the planned lectures were perfectly suits the topic this year, and that was exactly what I value the most. The second thing is that the venue of the school was so excellent. I loved everything about the school, and I would definitely want to participate again in the future!

Q9-Please, tell us about the worst things of the school (what we should NOT consider in future editions)



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I cannot recall any.

provide more information beforehand.

I think there was a bit too much focus on revering Dr. Donna Strickland. But that's just my personal opinion.

people that are working in the hotel do not speak english

coffe breaks ;)

I suggest to improve the food for vegetarians and vegans with different variety.

No one at the reception speaking basic english was a big let down

lunch/dinner menu in English

I have to say I enjoyed everything about the school, everything was well considered, and all staff are friendly and helpful!

Q10-Do you have any suggestions, comments ...?

It was a pleasure attending the school

Not much. Thanks for the invitation to school.

Maybe it will be more convenient for the guests if the reception speaks a little English. Sometimes it was really difficult to communicate or ask questions.

to have people in the hotel to speak english

Should have some practical Hanson sessions, it's my suggestion

It was really nice

There can be possibility of practical demos of some scientific experiments if possible alongwith lectures. One separate session of practical demonstrations.

I loved everything about the school. I hope it will continue its high quality and well organization. I appreciated it that there was a main core of the school, meanwhile there were several sections, and each section had a round table discussion. It helped a lot to target on the sections that were most helpful to our own research area.



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7.- Summing-up

The International School on Light Sciences and Technologies (ISLiST) at the Menéndez Pelayo International University (UIMP), Spain, has consolidated as an international reference at the highest scientific and technical level. It is confirmed on the fact of the highest quality of the lectures of the best experts (including the **2018 Nobel Prize in Physics, Donna Strickland**) of the most renowned institutions and organizations in the world in the use of Light Sciences and Technologies in Sources, in Health and Medicine, together with the numerous and high qualification of international participants. ISLiST was founded and is, since then, directed by José Miguel López-Higuera that has been assisted by Adolfo Cobo García, both of the Photonics Engineering Group of the University of Cantabria, CIBER-BBN and IDIVAL.

In its fourth ISLiST edition, it had more than 70 attendees from 13 nationalities and from more than 25 different institutions gathered in the week of June 21 to 25, 2019, in Santander, Spain to receive the knowledge and experience of 15 from the most reputable professors and professionals (all Drs) of the most reputable academic and research institutions and companies of 10 different nationalities. They also enjoyed the Santander Council Reception, where they took advantage of the great opportunities to do networking on matters of their interest.

The ISLiST participants (60% PhD students and 30% female) had the privilege to receive the teachings and experience of researchers of the stature of the laureate with the 2018 Nobel Prize in Physics, Donna Strickland, and of professors, Rod Taylor, Luis Roso, Aydogan Ozcan, Susana Marcos, Sune Svanberg, Michael Hamblin, Katarina Svanberg, Mark Hutchinson, Laura Lechuga, Kishan Dholakia, Walter Margulis, Robert Huber and JM López-Higuera. They also received the experience of reputable professionals such as Dr. Jan W. Denneman (Honorary Ambassador of the Global Lighting Association) and also from Dr. Pere Pérez-Millán (Co-founder and CTO of Fyla Lasers). Very hot topics in the use of light sciences and technologies in sources, health and medicine were presented and discussed along of the 16 one-hour lectures and two round tables that focused on the search for challenges pending both in light sources (round table I) and in the use of Light in the Health and Medicine sectors (round table II)

<https://www.teisa.unican.es/ISLiST/index.php/program>

Unforgettable were also the fresh and enthusiastic questions and discussions among the participants and the panellists of the two round tables.

To continue with the ISLiST mission to educate people (all around the world) on Light Sciences and Technologies even after the event, videos of fourteen invited talks (as they were) can be found in UIMPTV: <https://www.uimptv.es/c-cursos2019-01del17al21dejunio-179.html>

During the ISLiST at UIMP, Professor Strickland was awarded the Julio Peláez Prize and was also invested Doctor Honoris Causa by the UIMP acting, in this last ceremony, Professor López-Higuera as her godfather. <https://www.eldiariomontanes.es/culturas/uimp-inviste-doctora-20190620151859-nt.html>



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Before the solemn DHC ceremony, Prof. Strickland was interviewed by her godfather and Director of ISLiST, Prof. López-Higuera. It can be enjoyed by visiting YouTube: <https://www.youtube.com/watch?v=sDwCIG-Tq0E>

Thanks to the Santander Council Reception, the attendees and the invited speakers had the opportunity to share thoughts, experience and to do networking inside an unparalleled place, the Royal Palace of Magdalena, and having snacks and drinks. Thank you for that opportunity to Ayuntamiento de Santander.

According to the post-ISLiST survey, the quality of the program, of the speakers, of the complementary events, of the facilities offered, can be considered at the top level worldwide. ISLiST has met their expectations. As numeric indicators it can be consider that 86,7% of the attendees agreed with the excellence of the invited speakers, the 100% of the attendees very happy to recommend ISLiST to other colleagues and surprisingly the 80% indicating their interest in participating again in next editions of the ISLiST School.

More details: <https://www.teisa.unican.es/ISLiST/>



International School on Light Sciences and Technologies (ISLiST)

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ANEX

ISLIST-2019 PROGRAMME

Monday, 17

10:15 h

Opening Ceremony

10:40 h / **Break**

Light to see with smartness and treatments of the visual human system

11:00 h / **Opening Talk**

Toward a Thinking Microscope: Deep Learning-enabled Computational Microscopy and Sensing

Prof. Aydogan Ozcan

Director, Bio&Nano-Photonics Laboratory, Chancellor's Professor University of California, Los Angeles, USA

12:10 h / **Invited Talk**

Light in the Diagnostics and Therapy of the Vision human system

Prof. Susana Marcos

Director, Visual Optics and Biophotonics Lab, Instituto de Optica, CSIC, Spain

13:30-15:00 h / **Lunch Time**

Afternoon: Light helping to maintain and to recover the health

15:30 h / **Invited Talk**

Light in Sources, Health and Medicine

Prof. José Miguel López-Higuera

Director, ISLIST and Head of Photonic Engineering Group of UC, CIBER-BBN and IDIVAL, Spain

16:40 h / **Invited Talk**

"Light, you need it!!". Semiconductor LED and Intelligent Lighting sources: Recent advances and their impact on mood and health

Dr. Jan W. Denneman

Founder, GoodLight Group / Honorary Ambassador of the Global Lighting Association, Netherlands



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Tuesday, 18

Morning: **Light Sources**

9:30 h / Invited Keynote



From nonlinear Optics to High-Intensity Laser Physics

Prof. Donna Strickland

Nobel Laureate in Physics 2018

Department of Physics & Astronomy, University of Waterloo, Canada

10:40 h / Break

11:00 h / Invited Talk

Fiber based light Sources: from the UV to the mid infrared

Prof. Rod Taylor

Head, Femtosecond Optics Group, Imperial College of London, UK

12:10 h / Invited Talk

Petawatt lasers and their potential applications in biomedicine

Prof. Luis Roso

Director, Spanish Center for Pulsed Lasers, CLPU, Salamanca, Spain

13:30-15:00 h / Lunch Time

Afternoon: **Challenges on Light Sources**

15:30 h- 17:55 / Round Table I

Light Sources: Challenges to face

Prof. **Donna Strickland**, Nobel Prize in Physics 2018, University of Waterloo, Canada

Challenges faced during the path towards high intensity lasers

Prof. **Rod Taylor**, Head, Femtosecond Optics Group, Imperial College of London, UK

Challenges on Broadband fiber laser sources for medicine

Prof. **Luis Roso**, Director, Spanish Center for Pulsed Lasers, CLPU, Salamanca, Spain

Challenges on Petawatt and ultrafast lasers

Dr. **Pere Pérez-Millan**, Director, Fyla Lasers, Spain

Challenges to face a successful innovation process towards a Fiber laser small company

Prof. **JM López-Higuera**, Director ISLiST, Moderator

17:20 h / Special Event

Julio Peláez Prize / Awarding ceremony

Recipient: Donna Strickland



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Core: *Light in Sources, Health and Medicine*

Wednesday, 19

Morning: **Light for food safety and to recover health**

9:30 h / Invited Talk

Fighting antibiotic resistance and food Safety using light-based techniques

Prof. Sune Svanberg

Former Director, Lund Laser Center, Lund University, Sweden

10:40 h / Break

11:00 h / Invited Talk

The healing power of photobiomodulation or low-level light therapy (LLLT)

Prof. Michael Hamblin

Principal Investigator at Wellman Center for Photomedicine and Harvard Medical School, Boston, USA

12:10 h / Invited Talk

Early tumor detection using Light and its fighting using Photodynamic Therapy (PDT): What next for extensive use in clinic?

Prof. Katarina Svanberg

Chairperson, Medical Laser Centre, Lund University, Sweden

13:30 -15:00h / Lunch Time

Afternoon: **Light for Sensing**

15:30 h / Invited Talk

Towards quantification of pain using Light based approaches

Prof. Mark Hutchinson

Director, Centre for Nanoscale BioPhotonics, The University of Adelaide, Australia.

16:40 h / Invited Talk

Nano/micro-Biosensors using Light sciences and technologies

Prof. Laura Lechuga

Head, Nanobiosensors and Bioanalytical Applications Group, ICN2, CSIC, CIBER-BBN and BIST, Barcelona, Spain.

17:55 h ISLiST Family Photo

18:05 h / Special Event

Santander Council Reception

The Santander City Council will offer to ISLiST attendees a special reception that, in addition, will be an optimum time to share experiences and promote networking.



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Core: *Light in Sources, Health and Medicine*

Thursday, 20

Morning: **Light for manipulating and counting molecules**

9:30 h / Invited Talk

Optical Manipulation on Medicine Tasks

Prof. Kishan Dholakia

Director, SUPA, School of Physics & Astronomy, University of St Andrews, Scotland, UK.

10:40 h / Break

10:50 h / Invited Talk

Flow Cytometry using Optical fibre technologies

Prof. Walter Margulis

Senior Scientist, RISE-ACREO; Guest Prof. at KTH Royal Institute of Technology, Stockholm, Sweden

12:00 h / **Special Event**



Donna Strickland Doctor Honoris Causa Solemn Ceremony

UIMP will confer the Doctor Honoris Causa distinction to Prof. **Donna Strickland** by unanimous agreement of its Governing Council, which wants to recognize her relevant contributions to the Sciences and Technologies of Light.

13:30-15:00 h / Lunch Time

Afternoon: **Challenges on Light in Medicine**

15:45h- 17:45 / Round Table II

Challenges to face

Prof. Katarina Svanberg, Chairperson, Medical Laser Centre, Lund University, Sweden

Challenges to face to include PDT as a current clinical treatment

Prof. Michael Hamblin, Principal Investigator at Wellman Center for Photomedicine and Harvard Medical School, Boston, USA

Challenges on LLLT real clinical applications

Prof. Sune Svanberg, Former Director, Lund Laser Center, Lund University, Sweden

Challenges in using light based techniques in beating the antibiotic resistance and in food quality monitoring

Prof. Mark Hutchinson, Director, Centre for Nanoscale BioPhotonics, The University of Adelaide, Australia.

Challenges on Translational Biophotonics to Quantify Brain Health.

Prof. Robert Huber, Head, Biomedical Imaging and Laser Technology Group, University of Lübeck, Germany

Challenges on OCT clinical applications

Prof. JM López-Higuera, Director ISLiST, Moderator



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Core: *Light in Sources, Health and Medicine*

Friday, 21

Light on medical imaging

9:30 /Invited Talk

Wider, faster, deeper: new perspectives on imaging at depth

Prof. Kishan Dholakia

Director, SUPA, School of Physics& Astronomy, University of St Andrews, Scotland, UK.

10:40 h / Break

11:00 /Invited Talk

Imaging the tissue structure: advances in Optical Coherence Tomography

Prof. Rober Huber, Head, of the Biomedical Imaging and Laser Technology Group, University of Lübeck, Germany

12:15 h

Closing Remarks, Announcement of ISLIST 2020 and Diploma Delivery