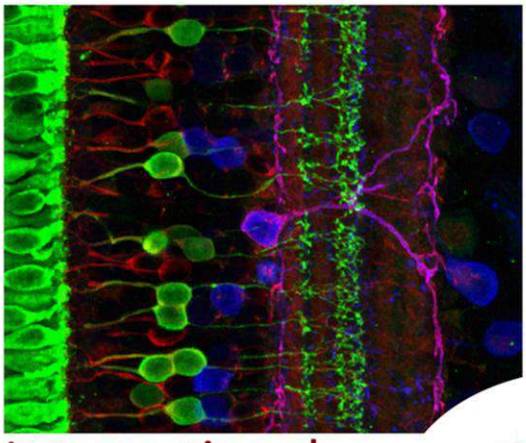
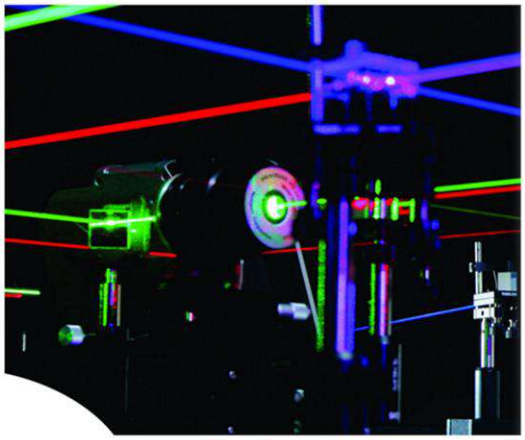
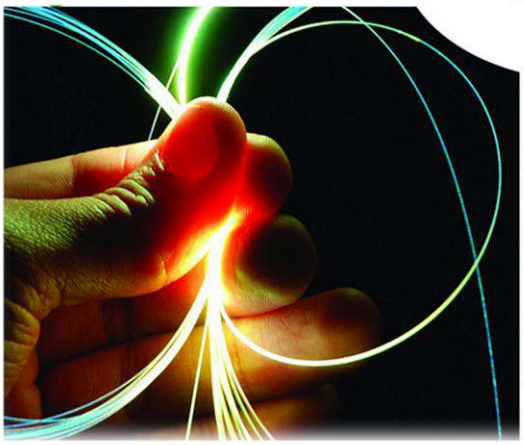
ISLiST / UIMP
Universidad Internacional Menéndez Pelayo

International School on **Light** Sciences and Technologies




Core: Light in Energy, Environment and Laser Manufacturing

Santander 16-20 de junio de 2025
(Sala Bringas-Riancho, Palacio de la Magdalena, Santander)

Final Report

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1. Executive Summary

This International School has been conceived as a great opportunity to review, update 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 framework for *networking* and also to contribute to the education of the public. It is also a great opportunity to ensure that legislators, entrepreneurs, and other key actors will be aware of the problem-solving potential of Photonics.

ISLIST is 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 for Energy, Environment and Laser Manufacturing*** was the core of this 2025 edition.

Fifty-eight (58) participants of 17 nationalities and from more than 21 different institutions or corporations met during the week of June 16 to 20, 2025, in Santander, Spain, for the VIII-ISLIST. They received knowledge and training/skills from 17 of the world's most reputable professors and professionals (of 8 different nationalities) from 16 academic research institutions and companies.

Figure 1.- General View of the Royal Palace of the Magdalena, venue of ISLIST every year.

The attendees had the privilege of receiving instruction and experience from researchers of the stature of Professors Christian Sattler, César Vidal, Antonio Gómez Expósito, Pierluigi Mancarela, Ivan Gordon, Jordi Martorell, John Edwards (representing Mike Campbell), Carlos Algora, Carlos Molpeceres, Christophe Caucheteur, Tong Sun, Miguel González, Christian Pedersen, and JM López-Higuera. They also benefited from the expertise of reputable professionals and researchers such as Javier Cavada and Mikel Bengoa. Very hot topics in the use of light sciences and technologies within Energy, Environment, and Laser Manufacturing were presented and discussed during the 17 one-hour lectures and two round tables. These sessions focused on identifying pending challenges in Light Energy (Round Table I) and in Environment and Laser Manufacturing applications (Round Table II). It is worth mentioning the very active participation of the attendees, both by asking questions and by sharing their thoughts after the lectures and during the round tables.

Sponsored by the Santander Council (Ayuntamiento de Santander), the VIII-ISLIST attendees enjoyed the Santander Council Reception, a great opportunity to share experiences and an optimum occasion for networking in an incredible Palacio de la Magdalena landmark enjoying "tapas" and drinks.

In order to achieve this 2025 ambitious program, the **Government of Cantabria** has sponsored this International School of UIMP. VIII-ISLIST has been also supported (as Gold collaborator) by one the more reputed international scientific societies such us **SPIE** the international society for optics and photonics (https://spie.org/); It was also supported for companies and professional organizations such as **Ric Energy Corporation** https://ric.energy/ (as Platinum collaborator) by, Ambar **Telecommunication** https://ambar.es/ (Silver) and **Acorde** https://www.acorde.com/ (Silver). It was also supported as bronze collaborators such as **OZ Optics** https://www.ozoptics.com/, **Copsesa** https://www.copsesa.com/**, ERZIA** https://www.erzia.com/,**TTI Celestia** https://www.ttinorte.es/, and **Santander City Council** https://www.santander.es/. We were also supported as Copper collaborators by **Semicrol** https://www.semicrol.com/, **Hotel Santemar** https://www.hotelsantemar.com/**,** and **Photonics Engineering Group** of UC, CIBER-BBN, and IDIVAL https://www.teisa.unican.es/gif. Without these Sponsor 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 for 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 Ninth Edition of ISLIST (June 15-19, 2026) will have the core on **Light in Health and Medicine.**

Santander, October 15, 2025.

Prof. José Miguel López-Higuera
Director ISLIST at UIMP

2.- VIII-ISLIST: A Successful and truly International School

The VIII-ISLIST at UIMP was widely acknowledged as a high-standard international meeting by both invited scientists/professionals and attendees. It was considered an edition with excellent organization, offering high-quality services, where cutting-edge ideas and technologies were presented and discussed, and where networking and the exchange of experiences were successfully carried out (as confirmed by the satisfaction survey).

During the week, seventeen outstanding lectures covering a wide set of key topics on light sciences and technologies useful for the Energy, Environment, and Laser Manufacturing communities were presented and discussed. Additionally, future trends and challenges were commented on and debated throughout the two round tables.

It was truly a privilege to hear, see, ask questions of, and chat with the seventeen highly renowned professors and researchers from the most prestigious worldwide institutions in Europe, the UK, and the USA.

Figure 2. Family photo of the ISLIST-2025 participants. It was taken just before the Santander Council reception. Around, Invited Speakers and organizers. Courtesy of Photonics Engineering Group (CPEG).

2.1 ISLIST 2025: Some data

Fifty-eight (58) attendees from 17 different nationalities (representing over 21 different institutions) participated in this meeting. As shown in the geographical breakdown in Figure 3, the participants came from: Spain (more than 25), China, Mexico, Brazil, Cuba, India, Italy, Poland, Ukraine, Nigeria, Syria, France, Colombia, Bangladesh, South Korea, Sudan, and Portugal.

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

Regarding the previously mentioned students: 74% were PhD students, 7% were Master Students, 6% were Drs, and 13% were others (figure 4).

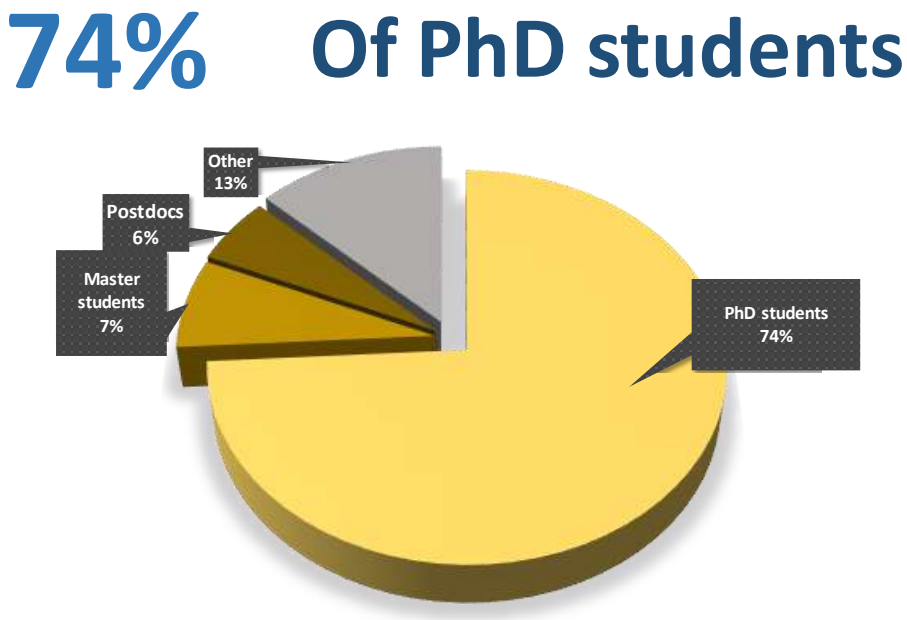


Figure 4.-VIII-ISLIST attendees by education.

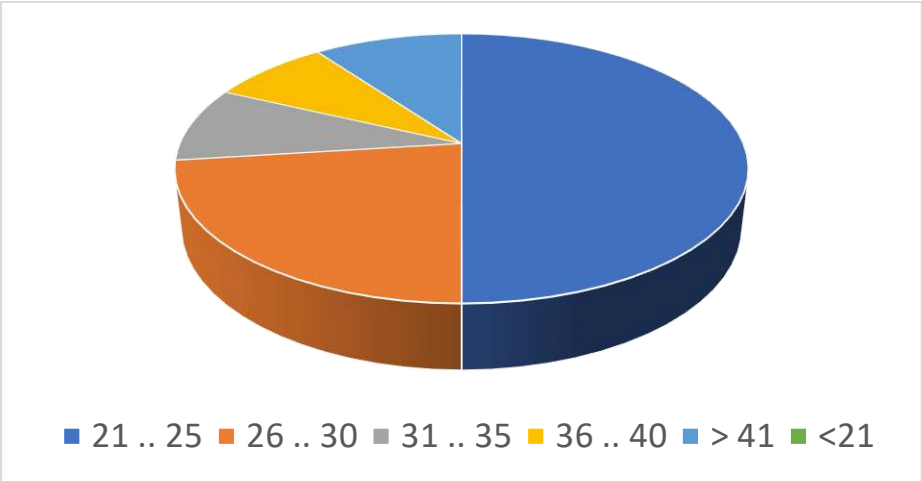


Figure 5.-ISLIST attendees by age.

In terms of participant age, 72% of the attendees were in the range from 20 to 30 years, which correlates with the period of education toward PhD degrees and post-docs. This fact suggests the very good acceptance of this top-quality school and its positive potential impact on the education of excellent researchers and professionals in the early stages of their careers. This will be a key issue for the near future of our globalized world, in which this key technology (Photonics) will play as relevant a role as Electronics played in the last 20th Century.

Concerning the gender distribution, 63% of the attendees were men and 37% women. This is in quite good correlation with the previous edition, and also suggests a slight decrease in the gender gap: ISLIST 2017 (74% men and 26% women); ISLIST 2018 (67% men and 33% women); ISLIST 2022 (70% men and 30% women). This also correlates with the real situation in many countries regarding technical and scientific jobs and education institutions.

Taking into consideration the number of women as students in undergraduate grade levels of current educational institutions, these numbers will progressively change toward a more homogeneous distribution without the need for any specific policy, just by fighting against any kind of discrimination. In any case, what will truly help to decrease this gap are policies facilitating the real work-life balance of families, with very special emphasis on the youngest.

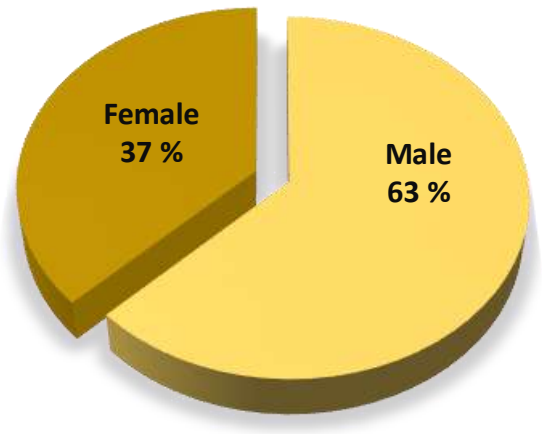


Figure 6.- ISLIST attendees by gender. Closing the gender gap.

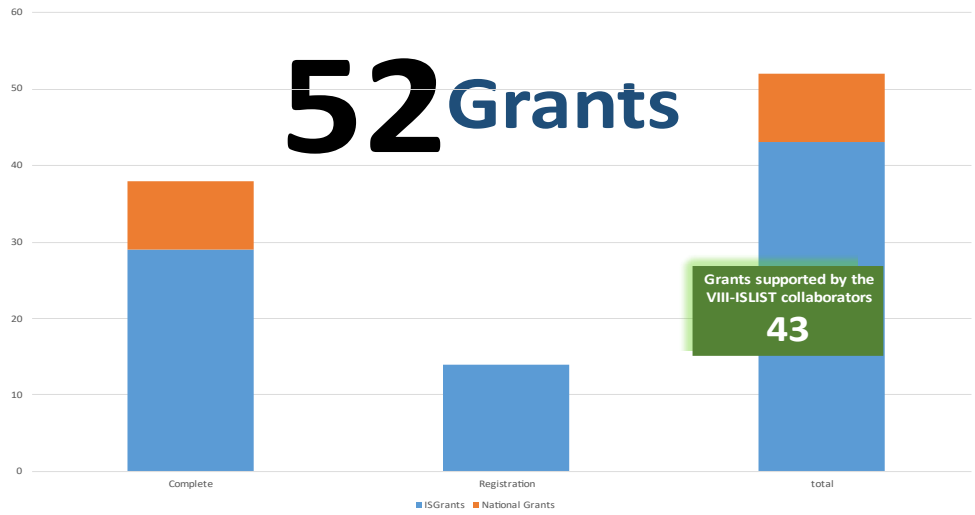


Figure 7.-ISLIST Student Grants distribution.

For Spanish Students or Students of any nationality but working/studying in Spanish institutions, UIMP offers grants with funds provided by the Spanish State. However, UIMP is not able to offer grants for any other international Students. 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. http://www.teisa.unican.es/ISLiST/index.php/grants. Thanks to the sponsors and collaborators, VIII-ISLIST was able to offer 29 full grants for **international** students from non-Spanish institutions.

A total of 52 grants were allocated. 43 with funds from the collaborators from what, 14 covered only the school registration fee. 9 full grants were funded by the Spanish State.

It is worthy to be mentioned that 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. This is confirmed by the highest quality of the lectures delivered by the best experts from the most renowned institutions and organizations in the world, specifically in the use of Light Sciences and Technologies in Sources, in Health and Medicine, together with the numerous and highly qualified international participants. In this regard, as 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 ISLIST's recognition as a top international forum. This recognition is "inscribed in the genes" of this very special **University of Universities** (UIMP).

3.- PROGRAM AND ITS DEVELOPMENT

The School Program was designed and published in the meeting web site. The program and notebook were and is available for all the VII-ISLIST participants at:
https://www.teisa.unican.es/ISLiST/images/2017-Slides/CompleteProgram-English-VII-ISLIST-UIMPv6.pdf

3.1 **The General Schedule of VII-ISLIST (2024 edition)** was programmed and developed as shown in figure 8.

Schedule

Time	Monday 16th	Tuesday 17th	Wednesday 18th	Thursday 19th	Friday 20th
9:30		**Prof. Pierluigi Mancarela** Australian Director of USA-UK-Australia Global Centre in climate change and Clean Energy Running a PV based net-zero grid in 2025: modeling and experiences form the Australian "real-wold lab	**Prof. John Edwards** **in the name of E. Michael Campbell** President MCM Consultants, Director Emeritus, Lab. For laser Energetics (LLE), University of Rochester, USA **Perspectives on Inertial Fusion Energy: Opportunities and Challenges**	**Prof. Ton Sun** Head of Sensors and Instrumentation goup, City University of London, UK Monitoring wastewater treatment infrastructure using optical fibre sensors	**Prof. Christian Pedersen** Head of Optical Sensor Technology Group Technical University of Denmark Atmospheric LIDAR sensing for a green transition
10:15	Opening Remarks				
10:40	Coffee Break	Coffee Break	Coffee Break	Coffee Break	Coffee Break
11:00	**Dr. Javier Cavada** President and CEO of Mitssubishi Power for Europe, middle East and Africa **The pillars of the decarbonization: impact on the development of a new world**	**Prof. Ivan Gordon** Head of Photovoltaic Technology and Energy Systems group, IMEC, Belgium **Photovoltaic Solar Cells technologies: Currents, Challenges and Opportunities**	**Prof. Carlos Algora** Head of III-V Semiconductors Group, UPM, Spain **Photovoltaic laser power converters for Power-by-light Systems**	**Prof. Miguel González Herráez** Head of Photonic Engineering Group, University of Alcala de Henares, Spain **Fiber Distributed Sensing on Energy and environment applications**	**Prof. JM López-Higuera** Emeritus Professor, Photonic Engineering Group, University of Cantabria, Spain **Cleaning the environments with energetic photons**
12:10	**Prof. Christian Sattler** Head, of solar Chemical Engineering German Aerospace Center, Germany **Concentrating Solar heat for power generation and chemical processes: current trends**	**Prof. Jordi Martorel** Head, organic nanostructured Photovoltaic, ICFO; Spain **Nano-photonics to raise the upper limit for-Energy Conversion in solar cells**	**Prof. Carlos Molpeceres** Director, Laser Institute, UPM, Madrid, Spain **Laser Technology in Photovoltaics**	**Prof. Christian Pedersen** Head of Optical Sensor Technology Group Technical University of Denmark **AI assisted aquatic LiDARs for remote sensing of the ocean**	12:15 **Closing Remarks, ISLIST-2026 Announcement and Diploma Delivery**
13:30-15:0	Lunch	Lunch	Lunch	Lunch	
15:30	GREEN and BLUE H2 production in Cantabria: **Mr. José L. Moya,** Ric Energy CEO, RiC-Copsesa consortium, Spain **Besaya H2 project** **Prof.César Vidal,** Emeritus Professor of of UC at IH, Supercl. Atlantic Wind, Spain **Bahía H2 Offshore project**	Round Table I: Light on Energy: Challenges to face and Opportunities Dr. Cavada: by Mitsubishi power on the decarbonization road-map *Prof Sattler*- by using concentration solar power for green fuels real production *Prof. Mancarela*- to reach effective and eficent energy storage Technologies *Prof Gómez: for the Stability and Resilience of the electric power system with massive penetration of renewables.*	**Mr. Mikel Bengoa** General Director, Coherent Rofin, Spain **Laser technology in Advanced Batteries fabrication**	Round Table II Light on Environment and laser Manufacturing: Challenges to face and Opportunities *Prof. Sun:* challenges to reach reliable OFS for environmental applications *Prof Pedersen:* multimodal LIDAR based sensing technology to monitorize underwater life *Prof. Molpeceres: on laser manufacturing.* *Prof. González:* to reach reliable fiber distributed sensors for Energy and Environment	
16:40	**Prof. Antonio Gómez Expósito** Lead Scientist, energy systems Expert **The photovoltaic revolution: from the fire age to the light age**	Moderator: JM López-Higuera	**Prof. Christophe Caucheteur** Head, Advanced Photonic Sensors Unit University of Mons, Belgium **Multimeasurand Advanced Optical fiber Sensor systems for real time Battery Monitoring**	Moderator: JM López-Higuera	
17:55			**Family Photo** **Santander City Council Reception**		

Figure 8.-ISLIST-2024 General Schedule.

The **ISLIST-2025 Speakers** are also, shown in the figure 9.

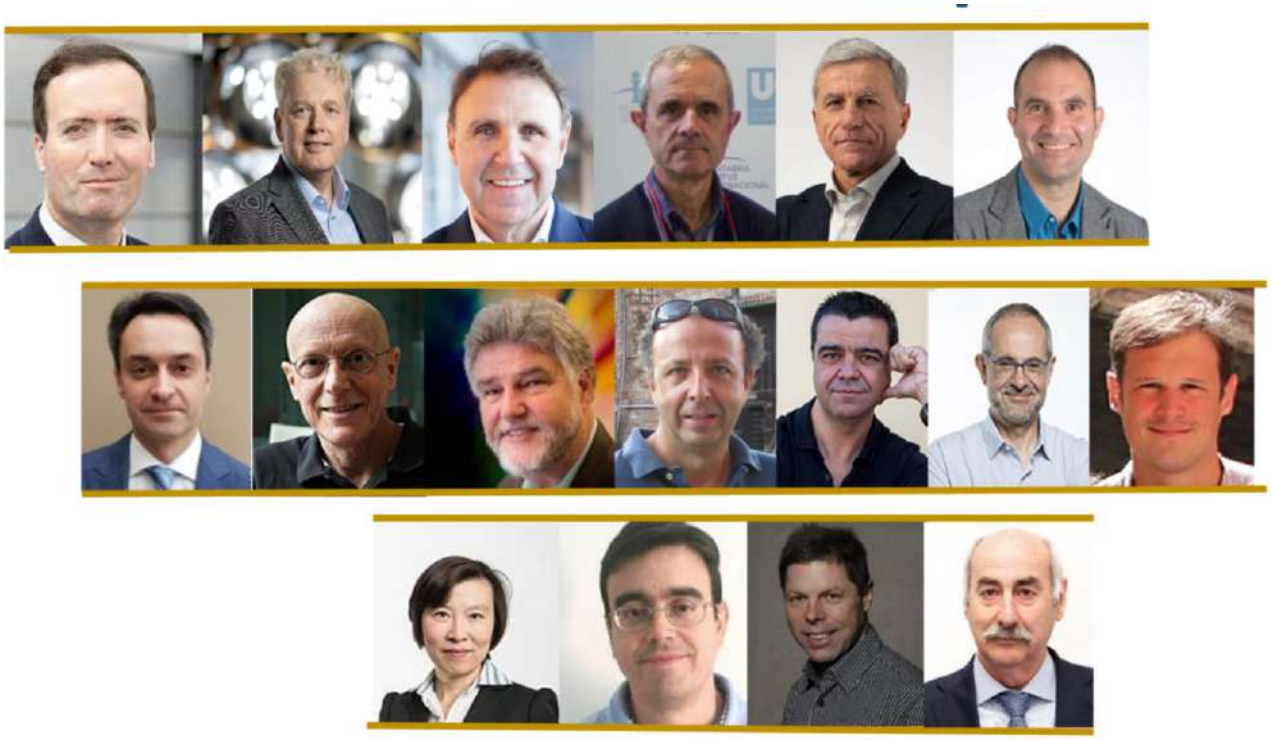


Figure 9.-ISLIST-2025 Speakers (by apparition order).

3.2 Invited Talks and Round Tables in the frame of VIII-ISLIST

After the Opening Ceremony, from June 16 to June 20, 2025, 18 invited talks and two Round Tables were developed. All photos used in this report are courtesy of the Photonics Engieering Group of University of Cantabria.

Dr. Javier Cavada *(President and Chief Executive Officer, CEO, Mitssubishi Power for Europe, Middled East and Africa)* delivered an outstanding, clarifying, inspiring and useful opening invited lecture entitled **"The pillars of the decarbonization: impact on the development of a new world".**

Dr. Cavada started his talk with a brief review of the background, in which he emphasized that as the world accelerates toward a carbon-neutral future, decarbonization has become the foundation for sustainable economic and industrial development. Because of this fact, in his enthusiastic opening lecture, he explored the key drivers of the energy transition: renewable integration, energy storage, hydrogen innovation, and advanced power generation technologies.

By using the "auctoritas" (authority) gained over more than two decades of leadership in the global energy sector, Dr. Cavada shared insights on how industries can achieve deep decarbonization while ensuring affordability, reliability, and security of supply. Drawing from his experience transforming major corporations toward sustainability, he highlighted groundbreaking solutions that are shaping a cleaner, more resilient global energy landscape.

Throughout his invited talk, Dr. Cavada shared his expertise and perspective, which flowed through three strategic pillars: the needed decarbonization of existing infrastructure, the development of a global hydrogen economy, and the rise of a carbon value chain.

Summing up, it can be stated that Dr. Cavada's didactic, deep, and useful lecture provided the VIII-ISLIST attendees with a strategic outlook on the critical role of technological innovation, policy frameworks, and investment in paving the way for a carbon-free future—reshaping economies and societies worldwide.

Figures 10,11,12 &13.- Three moments of Dr. Cavada during the development of his invited opening talk and along the questions time. Inset: a slide used in his intervention

Prof. **Christian Sattler** *(Director of German Aerospace Center, DLR´s, Institute of Future Fuels; vicepresident of Hydrogen Europe Research association)* developed his invited lecture on **Concentrating Solar heat for power generation and chemical processes: current trends.**

He started with a brief introduction, stating that the production of electricity and chemical commodities, especially fuels, by concentrated solar radiation is an option for efficient industrial applications. He added that the concentrated radiation can be used to replace fossil fuels, even on a large scale. Then, he mentioned that solar simulators are currently used for R&D and that the scale-up is done on solar towers.

Figures 14,15&16. Prof. Sattler in two moments one along his lecture and answering a question from an attendee.

He commented that the first industrial demonstration plant was inaugurated in 2024 and that the next is under development. Then he told that in Europe is consider an important driver the European regulation on synthetic aviation fuel that is in place since this 2025 year.

Professor Sattler also spoke about the concentrator systems, mainly heliostat fields, mentioning that they are currently based on installations for power production. However, he added that chemical reactions require a different heating regime, and therefore, special optics and control systems have to be developed.

Professor Sattler's presentation offered the attendees a very useful overview on the concentrating solar technologies for energy applications like power production and chemical processes, along with an insight into how to design the required heliostat fields, secondary optics, and control systems, including the integration of Artificial Intelligence.

After the two invited presentations in the morning in what were stated the reasons towards a decarbonized world and also technologies to produce fuels from the sum power, two invited talks were developed considered two ongoing projects concerning **GREEN and BLUE H2 production in Cantabria**: Besaya H2 and Bahia H2 offshore projects.

Figures 17,18 &19.-Mr. ***Moya*** *hearing his introduction by the director of the ISLIST and also in two moments during the development of his invited talk.*

Mr. **José Luis Moya Jiménez** (*founder and CEO of RIC Energy group*), as leader of the Ric Energy-Copsesa consortium, gave a brief presentation of the Ric-group before going into detail by giving an overview of the main aspects concerning the **Besaya H2 Project**. He mentioned that Besaya Green H2 is a project to produce green hydrogen and sustainable aviation fuel (eSAF), located in the municipalities of Torrelavega and Santillana del Mar. The initiative proposes the reindustrialization of the former Sniace land through the installation of a 250 MW green hydrogen plant, aimed at producing 60,000 tons of eSAF annually, which would be equivalent to more than 9,000 flights between Santander and Rome, he added. Mr. Moya concluded his presentation by recalling that the Besaya Green project will significantly contribute to the decarbonization of the aviation sector, the economic revitalization of the region, and the generation of sustainable employment in the area.

Prof. **César Vidal Pascual** (*Emeritus Professor at UC, former director of the Oceanographic and Coastal Engineering Group laboratory, precursor to the UC Institute of Environmental Hydraulics -IH Cantabria)* in representation of the Supercluster Atlantic Wind, SAW, spoke about **Bahía H2 blue offshore project**.

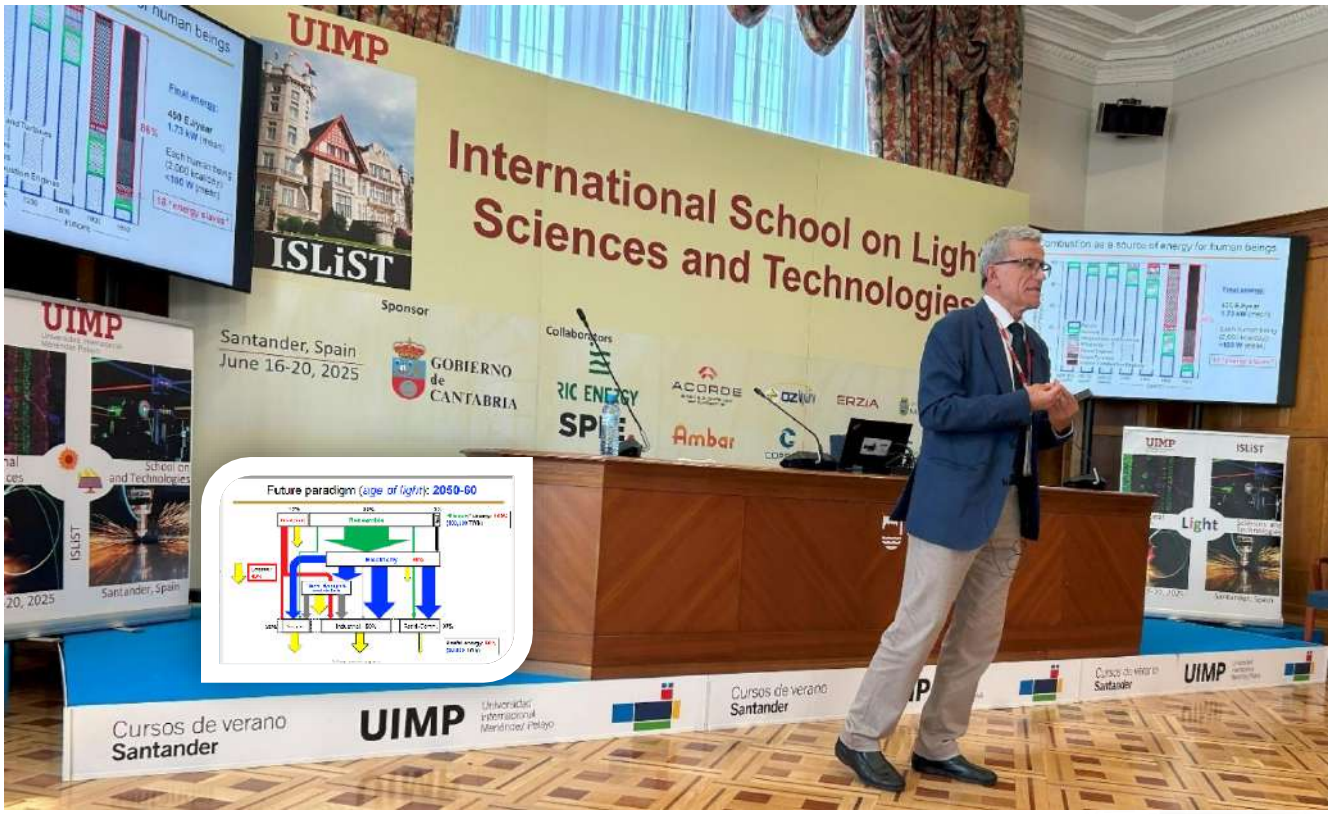
Prof. Vidal Pascual started his presentation with an introduction in which he mentioned that among the e-fuels, green ammonia is emerging as a main contributor to the decarbonization of the

Figures 20,18 &22.-Prof. ***Vidal Pascual*** *in three moments during the development of his invited talk.*

marine transport. Then he added that in this context, the Bahía H2 project objective is to develop offshore Floating Production, Storage and Offloading vessels (FPSOs) that anchored and connected to floating offshore wind farms, will work as offshore transport hubs for ammonia e-fuel for maritime transport and other uses. Then he described details of the project.

It is worthy to be mentioned that he emphasized that the first step objective of the Bahía H2 project is to produce green H2 in a barge in Santander Port. This will be achieved by using renewable wind energy and sea water, while the H2 storage needs and NH_3 production via the Haber-Bosch process will be numerically simulated, taking into account the variability of the wind power source. Also, environmental concerns relative to H2 and ammonia transfer and storage will be analyzed, he concluded.

Prof. Antonio Gómez Expósito *(Director of "Endesa Red" Chair, University of Sevilla, Spain),* delivered a lecture entitled **The photovoltaic revolution: from the fire age to the light age.**



Figures 23&24. Prof. Gómez Exposito in two instants along his invited lecture; In the inset, the last slide used in his talk.

Prof. ***Gómez Expósito*** *started his inspiring and well-founded lecture mentioning that homo sapiens* have relied on fire for at least the last 500,000 years. In the last two centuries, though, civilization has become addicted to the combustion of fossil fuels in their multiple forms, which has brought well-known negative consequences, he added.

In the current 21st century, modern renewables have come to the rescue, he stated. Then, he argued that despite having matured a decade later than wind energy, photovoltaic (PV) energy now features over 2 TW of global installed capacity and will reach 8 TW by 2030. Then, he did an overlook about the current situation by mentioning that about 45% of the global PV capacity is installed on rooftops, with major differences between regions/countries, depending on land availability, policy incentives, etc. illustrating every statement with very well-designed slides. While traditional stakeholders are betting on centralized PV, distributed PV offers advantages to customers and local communities, he added.

In short, along his invited talk Prof. Gómez Exposito reviewed the current panorama of PV technology, the drivers and barriers for centralized and distributed developments and the prospects for PV to become the main source of electricity worldwide. He argued that the challenge is to transform a fossil-based global system, that wastes 2/3 of primary energy, into a decarbonized one, where electricity will provide 80% of the final energy and the light of sun will provide 80% of electricity. Finally, we are in the process to change from the fire age **to the light age** in what the **light** from sun will provide about the 64% of total energy.

Prof. Pierluigi Mancarela *(Australian Director of USA-UK-Australia Global Centre in climate change and Clean Energy co-lead with Johns Hopkings university (USA) and Imperial College London, UK),* delivered a lecture entitled **Running a net-zero PV-based grid in 2025: modeling and experiences from the Australian "real-world lab.**

Figures 25&26. Prof. ***Mancarela*** *in two moments along his very comprehensive invited*

During his very well documented lecture, Prof. Mancarela, offered to the VIII-ISLIST attendees a comprehensive overview concerning the key ingredients to follow accordingly his talk.

He stated that with deeper and deeper penetration of variable renewable energy sources (RES) and distributed energy resources (DER) across

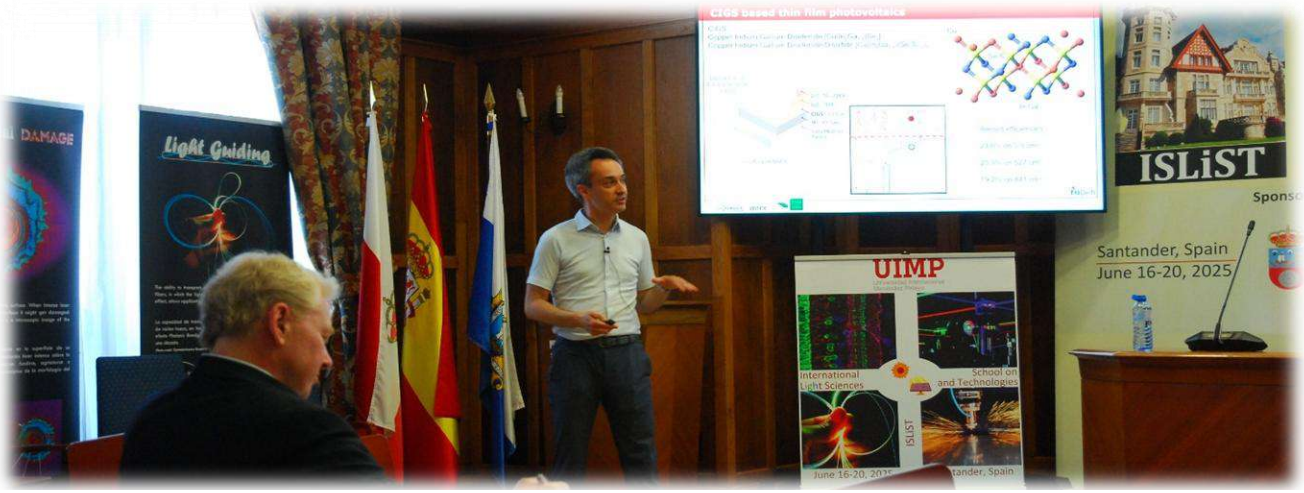
the world, new challenges had emerging in terms of their grid and market integration. His lecture illustrated the previously stated challenges from a techno-economic perspective, with focus on security, reliability and resilience requirements when operating power systems and markets with ultra-deep penetration of RES and DER.

Prof. Mancarela illustrated his statements with the support of real experiences from Australia, and particularly South Australia, which, at that moment, has already exhibited net-zero grid operation in the past couple of years. Then he when into an approach to the modelling inside the current's deep uncertainties. In addition, he discussed several technical, commercial and regulatory solutions and opportunities that, at that currents, are being deployed or considered, ranging from widespread adoption of both highly distributed and large-scale batteries to the development of "clean super-power" plans based on green hydrogen investment.

Prof. Mancarela Lecture was very complementary of Prof. Gómez previous talk and also, it was very opportune, at that time, because a month before happened the blackout affecting the entire Iberian Peninsula and parts of southern France.

Prof. Ivan Gordon (*Head of Photovoltaic Technology and Energy Systems group,* Interuniversity Microelectronics Centre*, Belgium),* delivered a lecture entitled **Photovoltaic Solar Cells technologies: Currents, Challenges and Opportunities**

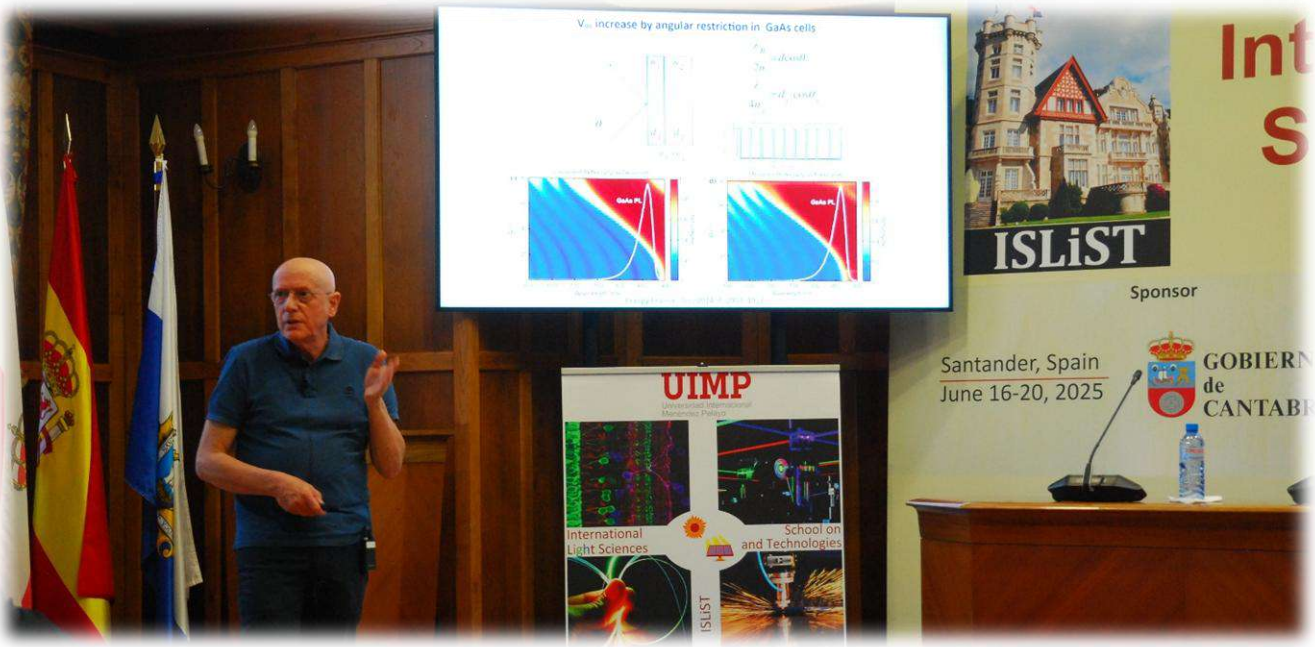
Along his presentation, after some general comments, he went into the essentials of the technologies and materials currently used. Professor Gordon offered a useful overview of the main technologies and materials currently used in the photovoltaic (PV) industry. In addition, he identified the main scientific challenges to be faced to further improve these technologies and to take photovoltaics into the Terawatt era.



Figures 27&28. Two instants of the Prof. Gordon Invited lecture: in the first moments of the talk (up right) and by answering a question addressed by an attendee (below).

He mentioned that around 500 GW of PV panels were produced, shipped, and installed worldwide during 2024. More than 95% of these panels use crystalline-silicon wafers as the active solar cell absorber material. For these reasons, a large part of the presentation dealt with the history, the current status, and the main R&D challenges of crystalline silicon photovoltaics. Professor Gordon concluded by stating that crystalline-silicon based tandem solar cells will be shown to be the way forward to overcome the theoretical and practical efficiency limits of single-junction silicon solar cells in the near future.

Prof. Jordi Martorell *(Group Leader, Organic nanostructured Photovoltaic, ICFO; Spain)*, delivered a lecture entitled **Nano-photonics to raise the upper limit for Energy Conversion in solar cells.**



Figures 29&30. Prof. Martorell during two moments along his invited lecture

Professor Jordi Martorell started his presentation by recalling that single-junction semiconductor solar cell devices can convert sunlight into electrical energy with a relatively low upper limit efficiency, established by Shockley and Queisser many years ago. He added that different intrinsic energy loss mechanisms, such as thermalization, below-bandgap transmission, or Boltzmann losses, limit the power conversion efficiency of such photovoltaic devices to less than 33.2%.

Then, he mentioned that overcoming thermalization or below-bandgap losses has been widely explored following different strategies, such as the tandem or multiple-junction approach. However, Boltzmann losses have been largely overlooked for several different reasons, which partially relate to a low fluorescence quantum yield in the majority of the photovoltaic materials used,

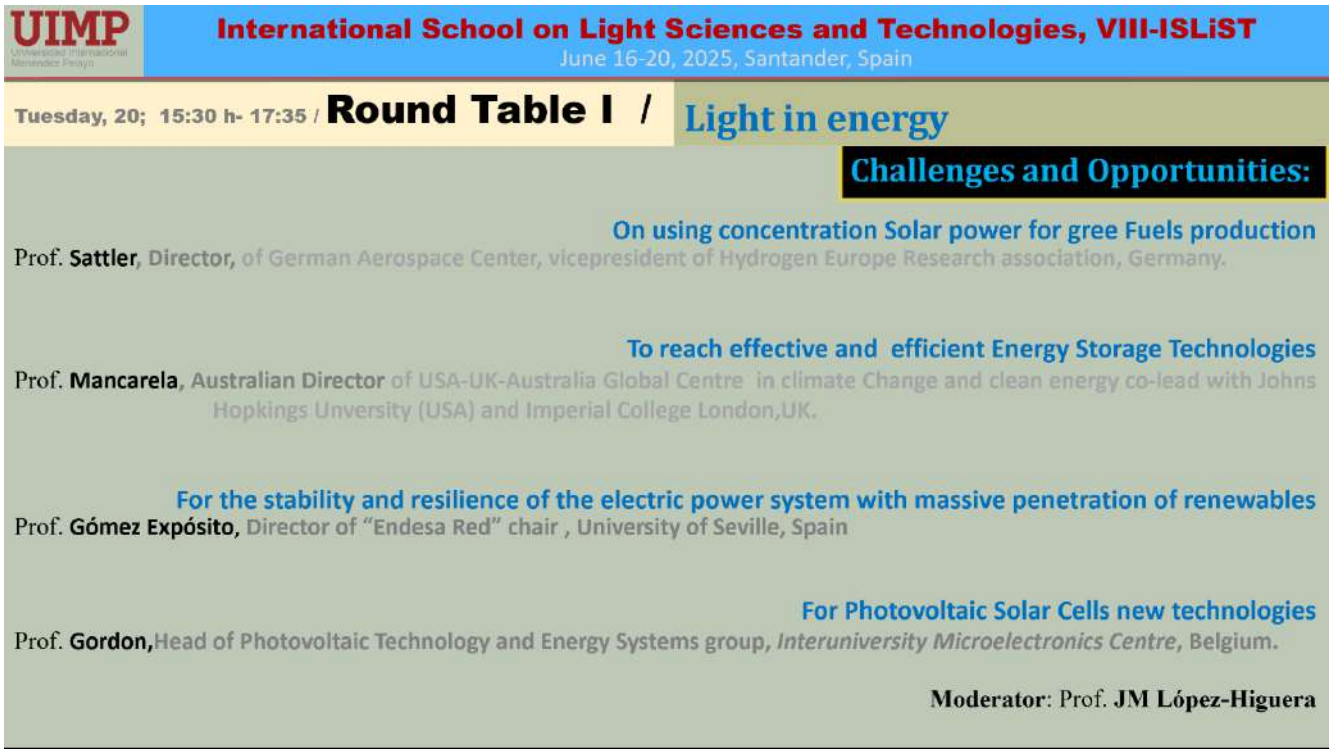
and the challenge of obtaining configurations simultaneously effective in trapping photons emitted by the photovoltaic material but also in capturing sun photons, he added.

Professor Martorell then went to the core of his invited lecture by stating that it has been proposed that an adequate nano-structuration of the solar cell architecture may lead to an upper limit conversion efficiency slightly higher than 42%.

In short, Professor Martorell, throughout his very well-documented and explained dissertation, discussed the design and fabrication of nano-structures which are effective in limiting radiative recombination without significantly altering sun photon absorption. He also offered routes to implement them in perovskite or organic solar cells.

During the **Round Table I** on **Light in Energy: challenges to face and Opportunities** the attendees and the invitees enjoyed a very interesting round table with very actives participations from both sides. After the moderator's presentation, each of the invited panellists presented their brief statement on their previously allocated topics as shown in table I.

Table I



The mentioned topics were opportunely presented and discussed by each of the panellists. 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.

Figure 31.- The panelists and the coordinator during the introduction of round table I by the coordinator

Numerous interactions were carried out among the panelists and from the attendees and discussions from both sides also took place. After near two hours, the round table concluded with several open questions and also with very interesting conclusions and statements.

Figure 32.- The panelists and the coordinator during a moment of their interventions in the round table I.

Figure 33.- Dr. John Edwards at first moments of his very relevant invited lecture online from California, USA.

It was fully planned (face to face in place) the first invited lecture on morning June 18th, 2025 by Prof. **Mike Campbell** *(President MCM Consultants, Director Emeritus, Lab. For laser Energetics (LLE), University of Rochester, NY, USA)* on a the very relevant topics on the frontier of knowledge: **Perspectives on Inertial Fusion Energy: Opportunities and Challenges**. However, an unexpected health trouble at the last-minute unable Prof. Campbell to come to Spain.

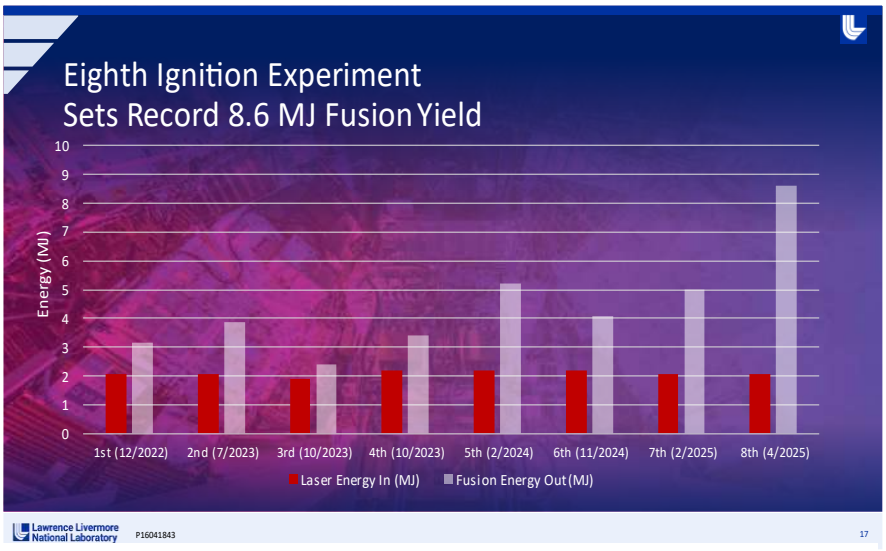


Figure 34.- A slide used along the Dr. Edwards invited lecture.

Fortunately, he got the compromise of one of his American relevant scientists in the topic and former colleague at LLE to deliver (online from California, USA) their lecture. So, inside the infortune, we were lucky to enjoy a great presentation from **Dr. John Edwards** *(Senior Advisor to the Strategic Deterrence Principal Associate Director at the Lawrence Livermore National Laboratory (LLNL) and a senior advisor to LLNL's Inertial Fusion Institutional Initiative).*

Dr. **Edwards**, in his introduction, developed a comprehensive justification concerning the need to decarbonize central power production, and then he motivated the invited lecture. He mentioned that the recent demonstration of fusion ignition and scientific gain greater than one at the National Ignition Facility has renewed interest in Inertial Fusion Energy (IFE).

Then Dr. Edwards mentioned that although none of the current facilities are equipped for implosion experiments, there is ample scope for research in areas critical to Inertial Fusion Energy (IFE), including: Laser-plasma interaction physics, foam target physics, novel approaches to fusion, development of rep-rated diagnostics, and also target fabrication and fielding technologies. Throughout his presentation, he highlighted the challenges facing IFE and also explored how public organizations such as the USA's LaserNetUS can significantly contribute to finally commercializing fusion energy.

Finally, very interesting questions, including one asking for a prediction about the time required to reach technology able to be exploited in the real world, were asked and kindly and appropriately answered by Dr. Edwards.

Summing up, throughout his presentation Dr. Edwards summarized the present state of fusion physics, and also identified both challenges to be faced and significant opportunities for a program focused on Inertial Fusion Energy, especially in the USA.

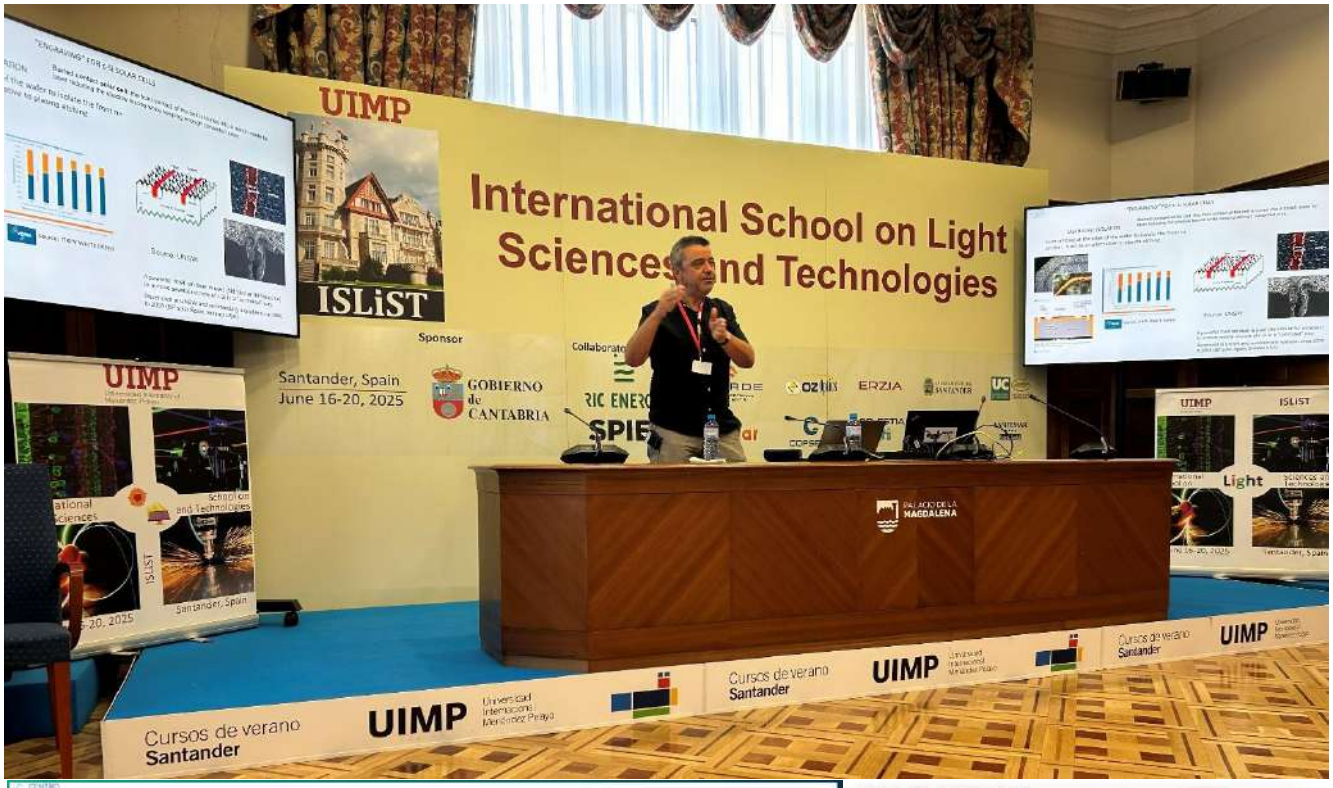
Figure 35.- Dr. Edwards during the questions time of his invited lecture.

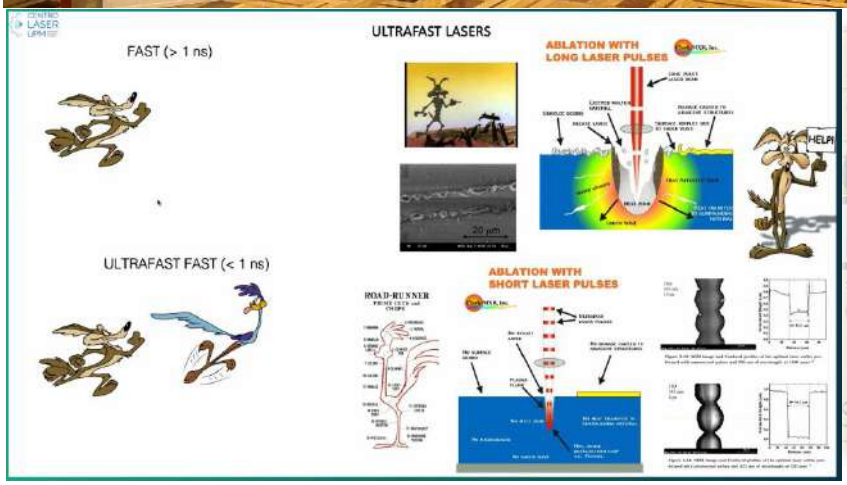
Figures 36&37. Two moments of Prof. Algora *invited lecture*

Prof. **Carlos Algora** *(Head of III-V Semiconductors Group, Universidad Politécnica de Madrid, Spain)* spoke concerning **Photovoltaic laser power converters for Power-by-light Systems.**

Prof. Algora after an introduction of the topic clarified that PhotoVoltaic Laser Power Converters (PVLPCs) are the core element of Power-by-Light (PBL) systems which are basically made up of a power laser, an optical fibre and a PVLPC. PBL allows the safe transfer of power in situations where the direct use of electrical energy to power electronic equipment is either not possible or not recommendable, he added. Then he mentioned that the first PBL system was built in 1978 but it has been only recently when PBL systems are having an outburst with continuous efficiency improvements, creation of start-ups, big companies entering the business, among others.

Summing up, in his interesting invited lecture, Professor Algora offered an overview of the functionalities of PBL systems, together with a brief outlook on the history of PVLPCs. He also offered the attendees a detailed comparison among the different typologies of PVLPCs in terms of efficiency, delivered power, voltage, temperature effects, and manufacturability, highlighting also their advantages and disadvantages depending on the application. He added that PVLPCs are the most efficient PV devices, approaching efficiencies of 70%. Finally, he identified the main aspects limiting the efficiency of PVLPCs and emphasized possible ways to enable their circumvention or at least their minimization.





Figures 38,39&40. Two moments of Prof. Molpeceres *and a didactic slide sample used* along his very comprehensive *invited lecture presentation.*

Prof. **Carlos Molpeceres** *(Director, Laser Institute, and Deputy Vice-rector for Research Centers and Institutes at Universidad Politécnica de Madrid, UPM, Spain)* spoke concerning **Laser Technology in Photovoltaics.**

He started his talk by reviewing key concepts required to properly follow his invited lecture. He stated that lasers have been used in the microelectronic and photovoltaic (PV) industry for decades, but more recently, laser processing has appeared as a key enabling technology to improve efficiency and to reduce production costs in high-efficiency solar cell fabrication.

Throughout his talk, Professor Molpeceres discussed the current role of laser technology in the photovoltaic industry, both in cell and module manufacturing. He illustrated his statements with specific examples such as wafer and cell processing and contact formation in silicon PV technologies, monolithic interconnection in thin film technologies, and solutions for soldering and encapsulation in module fabrication. He also discussed the impact of laser technology in the present and future development of Building Integrated Photovoltaics (BIPV), an area in which lasers offer outstanding solutions for product customization.

Professor Molpeceres concluded his very well-argued and useful talk by speaking about the impact that laser-based advanced manufacturing techniques, and in particular those based on ultrafast laser processing, are having in the present research of cutting-edge concepts that will define the photovoltaics of the near future.

In the afternoon a session on light technologies for fabrication and sensing in batteries was developed.

Figures41&42. Two moments of Mr. Mikel Bengoa along his practically oriented invited lecture presentation.

Mr. Mikel Bengoa *(General Director of Coherent Rofin, Spain) delivered the invited lecture entitled* **Laser Technology in Advanced Batteries Fabrication.**

He firstly talked about the transition from internal combustion engines to electrical power drives in the automotive industry and identified several challenges and opportunities for laser material processing applications.

Mr. Bengoa commented the new demands that are being generated by the e-Mobility transformation devoting a special attention the ones related with battery mass production, and the strategies that have been followed to overcome those demands from a laser design and fabrication perspective.

In the second lecture of the sesión, **Prof. Christophe Caucheteur** *(Head, Advanced Photonic Sensors Unit,University of Mons, Belgium)*, spoke concerning **Multimeasurand Advanced Optical fiber Sensor systems for real time Battery Monitoring.**

He, started his talk reviewing key need of knowledge to optimize the performance and lifetime of the current Batteries for Electric Vehicles. It is vital to understand and monitor, in real-time, the battery operations key processes during their entire lifecycle and assess their health during operation, he added. Then, he justified the reasons to choose the optical fibre sensor technology because its demonstrated excellent potential for batteries monitoring because their small size, high sensitivity, immunity to electromagnetic interference and remote sensing capability, he added.

Prof. Caucheteur reviewed the progress reached in the use of fiber Bragg grating sensors for the monitoring both physical parameters (temperature, strain, pressure, …) and chemical parameters

Figures 43&44. Two instants of Prof. Caucheteur along his invited lecture

(refractive index, gas, …) sensing in batteries. He mentioned some of the ongoing works in his R&D Group to reach a real-time monitoring sensing device to provide simultaneous measurements of temperature, strain, pressure, refractive index, turbidity and CO_2. He also emphasized the use of Artificial Intelligence techniques to manage the high account of data and extract the key relevant information for the application.

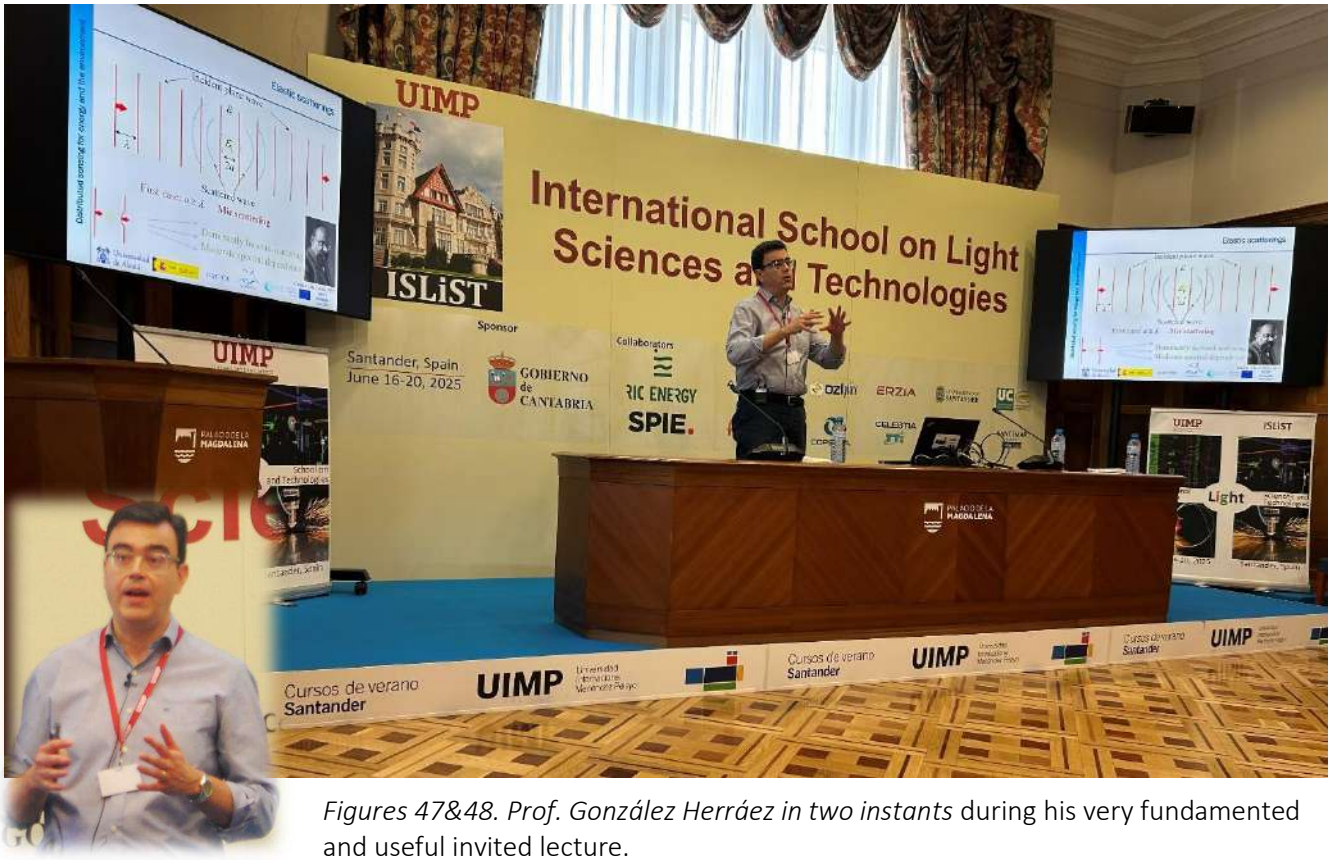
Prof **Tong Sun** *(Director of Instrumentation & Sensors Research Centre, City-University of London, UK)* spoke about **monitoring wastewater treatment infrastructure using optical fibre sensors.**

Figures 45&46. Two moments of Prof. Tong Sun during her very comprehensive and didactic invited lecture presentation.

She started his lecture mentioning that wastewater treatment infrastructure plays a crucial role in modern societies. It ensures the safe disposal and treatment of waste materials, preventing environmental pollution and protecting public health, she added. She also emphasized that the integrity of these kind of infrastructures is of critical importance for meeting the challenges of a rapidly changing world. Then, Prof. Sun offered to the attendees an excellent illustration of her previous statements by reviewing the historical case of London.

Then, she reviewed a series of research projects realized by City St George's of University of London and funded by Sydney Water in Australia to address the mentioned need. She shared details and results concerning the field deployment of photonic sensors in a wastewater treatment plant, sewer pump stations and sewer rising mains for early detection of possible structural failures. Finally, she remarked the works presented in his lecture because the knowledge gained on the conception and designs of sensors, their field implementation followed by their data analysis and visualisation are acting as driver to trigger engineering interventions to prioritise wastewater asset maintenance.

Prof. **Miguel González Herráez** *(Head of Photonic Engineering Group, University of Alcala de Henares, Spain)* was focused on the topic **Fiber Distributed Sensing in Energy and Environment applications.**

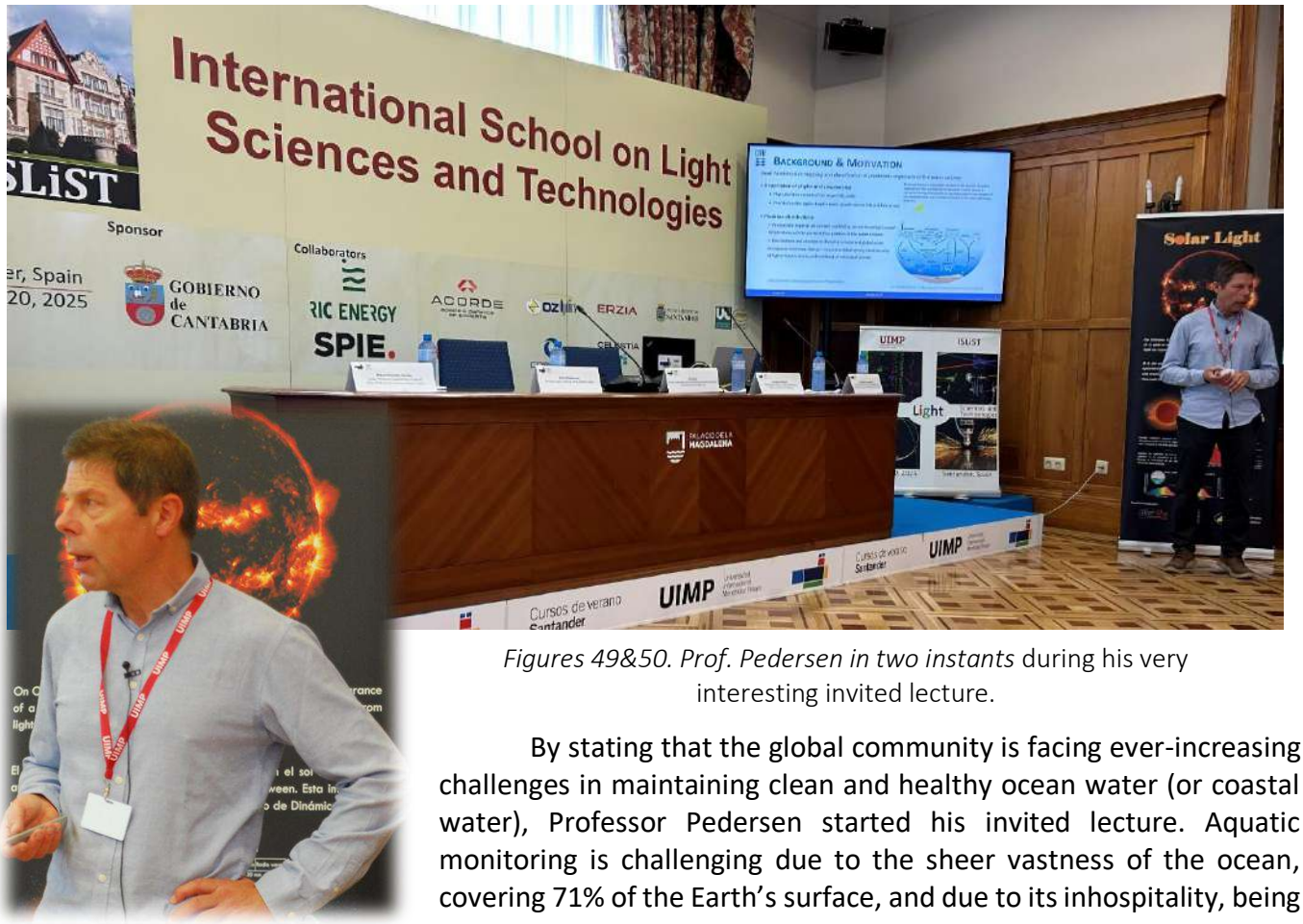


Figures 47&48. Prof. González Herráez in two instants during his very fundamented and useful invited lecture.

He started his invited talk by stating that among the different types of optical fiber sensors, the distributed ones are being increasingly used in the monitoring of large critical energy infrastructures such as large pipelines and power cables. Unlike traditional sensor networks, he added, distributed sensing systems convert a conventional optical fibre cable into a vast array of virtual sensors that can measure strain and temperature changes along its entire length, as well as many other static, quasi-static, and dynamic measurands. Professor González then devoted an important time to offer the attendees a relevant overview concerning key concepts and fundamentals to understand the different current approaches to fibre distributed sensors, with a special emphasis on those in which the measurand is codified in the phase, such as the Distributed Acoustic Sensing (DAS) family. DAS can be understood as a fibre-optic sensing technology that turns an optical fibre into a long array of sensors, detecting acoustic signals, vibrations, and strain over extended distances with high resolution, he explained. He then flew over several applications, including seismic monitoring, pipeline and infrastructure surveillance, security, and civil engineering, providing continuous, real-time data for early warning systems and monitoring, among others.

In summary, in his invited talk, Professor González reviewed the basic principles and limitations of fibre distributed sensors. He also provided evidence of the monitoring of significant environment parameters that are being performed with this fibre sensing technology, with a level of spatiotemporal detail that is unprecedented in any other monitoring tool for these purposes.

Prof. **Christian Pedersen** *(Head of Optical Sensor Technology Group, Technical University of Denmark, Paises Bajos)*, spoke about **Confocal multispectral LiDARs for AI classification of marine species in waterremote sensing of the ocean.**



Figures 49&50. Prof. Pedersen in two instants during his very interesting invited lecture.

By stating that the global community is facing ever-increasing challenges in maintaining clean and healthy ocean water (or coastal water), Professor Pedersen started his invited lecture. Aquatic monitoring is challenging due to the sheer vastness of the ocean, covering 71% of the Earth's surface, and due to its inhospitality, being aquatic, he added. He also mentioned that these two circumstances make autonomous LiDAR instrumentation promising. An important health indicator is the diversity and abundance of zoo- and phyto-plankton, since these constitute the lowest layer in the aquatic food chain, he stated. He then added that spatially resolved in situ monitoring of plankton can provide insights into the impacts of climate change on aquatic ecosystems due to their vital role in the biological carbon pump.

After that, he proposed that in situ optical tools unlock high-resolution measurements of sub-millimeter specimens, but state-of-the-art underwater imaging techniques are currently being limited to fixed and small close-range volumes, requiring the instruments to be vertically deployed. Because of this, Professor Pedersen devoted the rest of his invited lecture to present a novel scanning multispectral confocal light detection and ranging (LiDAR) system for short-range volumetric sensing in aquatic media. He concluded that the deployment of this photonic platform alongside AI models overcomes the complex and subjective task of manual plankton identification and enables non-intrusive sensing from fixed vantage points, thus constituting a unique tool for underwater environmental monitoring.

Figure 51. Professors González, Molpeceres, Sun, Pedersen and López-Higuera attending one of the first statements in the Round Table II.

During the **Round Table II** on **Challenges to face and Opportunities on Light in environment and laser manufacturing** the attendees experienced a very interesting round table with very actives participations from both sides (panellists and attendees). Moderated by the director of ISLIST, four relevant professors on their respective area of expertise. After the presentation by the moderator, each of the invited panellists presented their brief initial statement on their previously allocated topic. They were (Table II):

Table II

UIMP
Universidad Internacional Menéndez Pelayo

International School on Light Sciences and Technologies, VIII-ISLiST
June 16-20, 2025, Santander, Spain

Thursday 19; 15:30-17:35h / **Round Table II**

Light in environment and Laser manufacturing

Challenges and Opportunities:

Prof. Tong Sun, Director of Instrumentation & Sensors Research Centre, City-University of London, UK
in optical sensing technologies for environmental applications.

Prof. Pedersen, Head, of Optical sensor Group, technical university of Denmark
on multimodal LIDAR based sensing technology to monitorize underwater life

Prof. Molpeceres, Director, Laser Institute, UPM, Madrid, Spain
on laser manufacturing

Prof. Miguel González, Head of Photonic Engineering Group, University of Alcalá de Henares, Spain
to reach reliable fiber distributed sensors for Energy and environment

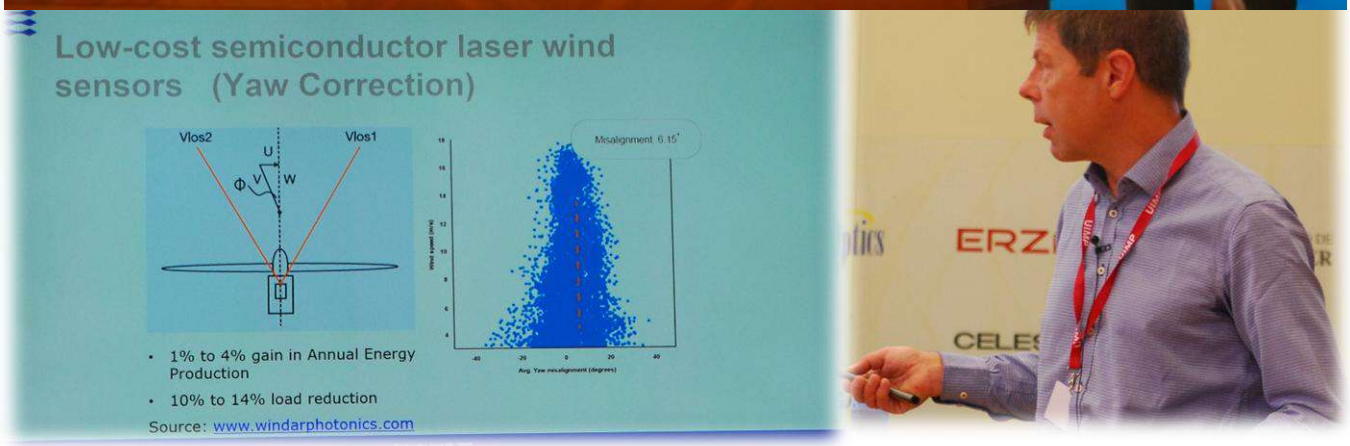
Moderator: Prof. **JM López-Higuera**

Figures 52,53,54,55&56.-The panelists (Professors González, Molpeceres, Sun and Pedersen) and moderator (Prof. López-Higuera) on several instants of their corresponding interventions. along the round table II.

The round table took, then, the common format and each of the panelist addressed their respective initial statement. Then, each member of the panel took the opportunity to debate different aspects among the panelists. After that, attendees asked a very significant number of 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 hours, the round table concluded with several open questions and also with very interesting and useful thoughts and conclusions.

After two hours, the round table concluded with several open questions and also with very interesting and useful thoughts and conclusions.

In the last scientific session of the VIII-ISLIST **Light in sensing for environment and energy**, two topics were treated by two very well-known Professors.



Figures 57,58&59.-Two moments of Prof. Pedersen Invited lecture and a slide used along his presentation

Prof. **Pedersen** *(Head of Optical Sensor Technology Group, Technical University of Denmark)* in his closing invited lecture spoke about how can be translated **Atmospheric LIDAR sensing for a green transition.**

He began his invited talk by reviewing the key requirements to optimize electricity production using wind turbines and also to monitor the quality of the environment.

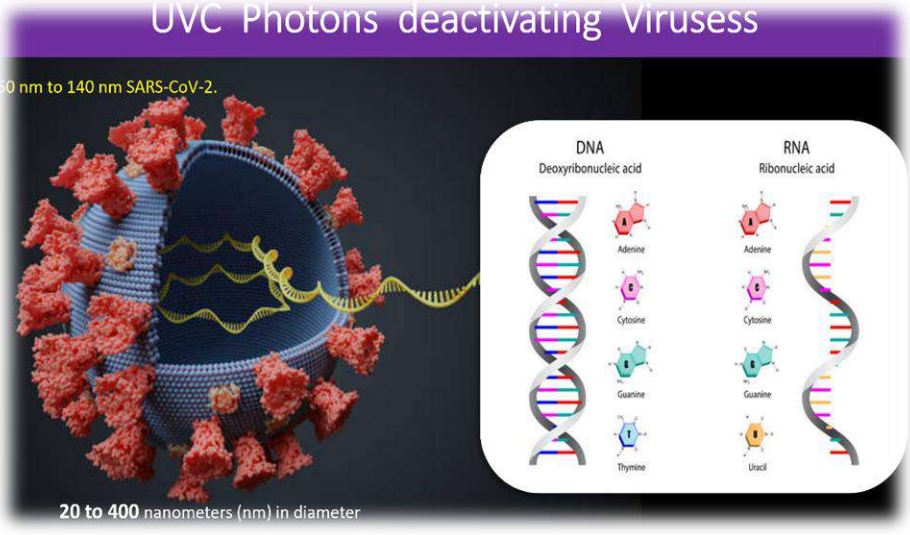
Firstly, he talked about the ability of coherent detection LiDAR systems to obtain spatially resolved measurements of atmospheric wind velocity from remote locations. For this reason, they have been applied to a growing number of applications such as characterization of wind farms, determination of wind turbine power curves, aircraft wake vortices, and true airspeed. Historically, he added, LiDAR products remain relatively bulky and expensive, and have thus been primarily limited as scientific instruments. To address the need for a more industrial LiDAR solution, Professor Pedersen then went into the R&D works of his group toward developing a new compact and low-cost wind LiDAR system based on a tapered semiconductor laser source. He added that their developed LiDAR system is commercialized for improved wind energy harvesting of wind turbines.

Professor Pedersen then went into environmental monitoring by using LiDAR-based gas sensing using direct laser absorption spectroscopy (DLAS) in stand-off configurations. Taking into account the fine spectrum of typical greenhouse gases, such as CH_4, CO_2, and N_2O, he stated that high-precision sensing is possible under field conditions by using LiDAR-based gas sensing. In addition, he mentioned that sensing accurately and fast, in combination with drones, provides a way forward for sensing the total emission factor (i.e., how many kg of gas per hour is emitted) of large industrial facilities, enabling legislation to be enforced as well as optimization of the plant.

In summary, throughout his invited lecture, Professor Pedersen offered the attendees a relevant piece of knowledge and technique useful for optimizing electricity production using wind turbines and also for monitoring the quality of the environments in which our lives are going on every day.

Prof. **José Miguel López-Higuera** *(Director ISLIST, Emeritus Professor and Head of Photonics Engineering Group of University of Cantabria, CIBER-BBN and IDIVAL, Spain)* delivered his lecture entitled **Cleaning environments with energetic photons.**

Professor López-Higuera first of all emphasized the relevance of Light Sciences and Technologies (Photonics) by recalling to the attendees the vast number of Nobel Prize awardees recognizing relevant works based on light approaches for human advancement over the recent 10 years. Then, he spoke about what should be understood as Photonics and also remarked the fact that Photonics is considered a Key Enabling Technology (KET) or an Essential Technology for the development of Europe, the USA, and other major nations around the world. He then very briefly summarized some key properties of Light and reviewed some key properties of Light-biological species such as absorption spectra and damage thresholds, among others, to understand the use of specific optical radiations to deactivate or even kill microorganisms. He then went into the core of the very intuitive lecture, presenting how it is possible to deactivate or kill pathogen microorganisms, such as viruses and bacteria, both in air and water environments. He used examples to illustrate and support his statements, including a specific and protected development he had carried out during the first weeks of the COVID-19 pandemic to protect the offices and R&D laboratory of his R&D Group. Finally, Professor López-Higuera offered several key "home-take-aways" to the VIII-ISLIST attendees, and after answering the questions from the school participants, he concluded his talk.



Figures 60,61&62.-Two moments of Prof. Lopez-Higuera closing lecture and a slide used along his presentation.

3.3 Some moments during the talks and free times

Figure 63.- A view of Dr. ***Cavada*** *inside the VIII-ISLIST during the question time at the end of his invited opening talk.*

Figure 64.- Prof. ***Sattler*** *during the question time at the end of his invited opening talk.*

International School on Light Sciences and Technologies (ISLiST)

June 16-20, 2025, Santander, Spain

Core: ***Light in Energy, Environment and Laser Manufacturing***

Figures 65,66 &67.- A view of Mr. ***Moya*** *and Prof.* ***Vidal*** *during their respective invited talks and Prof.* ***Gómez being*** *introduced by the director of the school.*

Figures 68,69 &70.- A view of Professors ***Mancarela, Gordon and Martorell*** *during their respective invited lectures.*

Figures 71,72,73,74 &75.- Professors ***Gordon, Mancarela, Sattler, Gómez and López-Higuera*** *during the development of Round Table I*

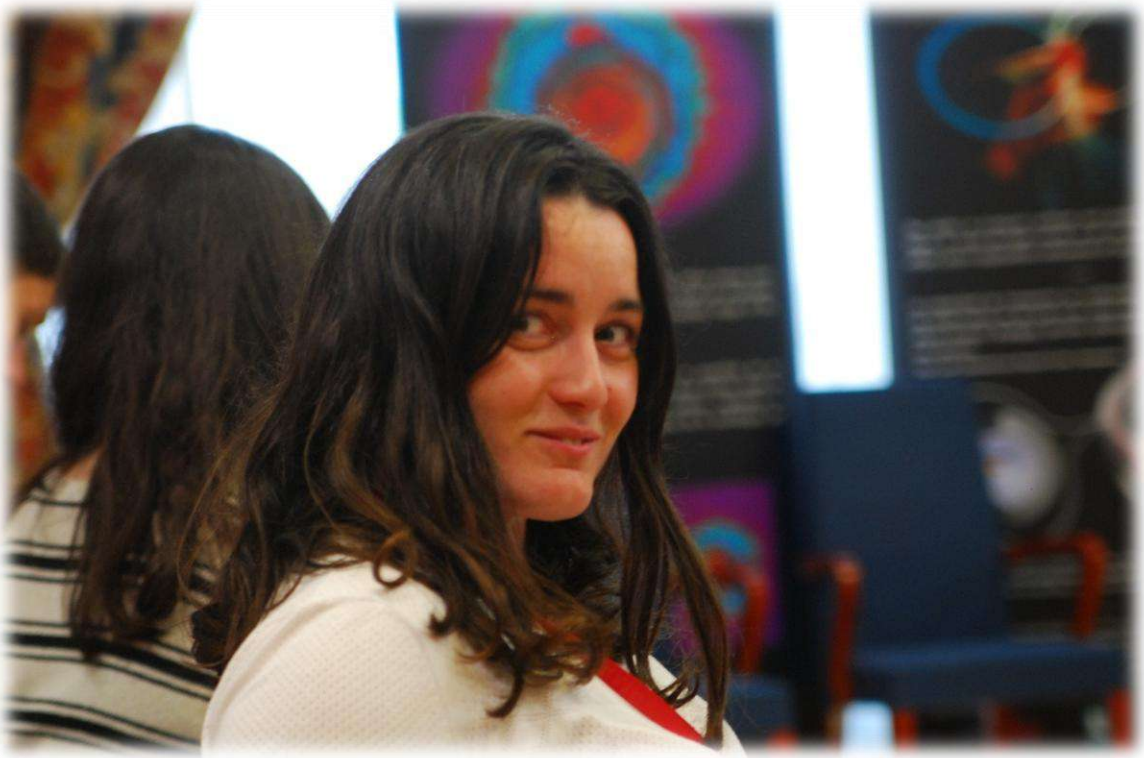
Figures 75,77&78.- Professors ***Edwards, Algora and Molpeceres*** *during moments along their respective invited lectures*

Figures 79&80- Mr. Nengoa and Prof. ***Caucheteur*** *during moments along their respective invited lectures*

Figures 81,82&83- Professors ***Sun***, ***González*** *and* ***Pedersen*** *during instants along their respective invited lectures*

Figures 84,85,86,87 &88.- Professors ***González, Molpeceres, Sun, Pedersen*** *and* ***López-Higuera*** *during the development of Round Table II*

Figures 89&90.- Prof. ***Pedersen*** *during the questions time of his invited talk and the secretary of VIII-ISLIST introducing the closing Speaker.*



Figures 91&92.- Two participants in VIII-ISLIST in free-times between different lectures.

Figures 93&94.- Several participants at VIII-ISLIST in free-times between different lectures.

4.-Family Photo and Santander Council Reception

A family photography was taken, on the back stairs of the Royal Palace of Magdalena, just before the Santander Council Reception.

VIII-ISLiST 2025 Family Photo

Figures 96&77.- VIII-ISLIST's participants in the Royal Hall during the welcome words from the vice-chancellor of Santander Council ***Javier García Ruiz*** *and from the Rector of UIMP Prof.* ***Carlos Andradas*** *(below) addressing the acknowledging to Santander Council for their collaboration to reach the objectives of this International School.*

International School on Light Sciences and Technologies (ISLiST)

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Core: ***Light in Energy, Environment and Laser Manufacturing***

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.

International School on Light Sciences and Technologies (ISLiST)

June 16-20, 2025, Santander, Spain

Core: ***Light in Energy, Environment and Laser Manufacturing***

International School on Light Sciences and Technologies (ISLiST)

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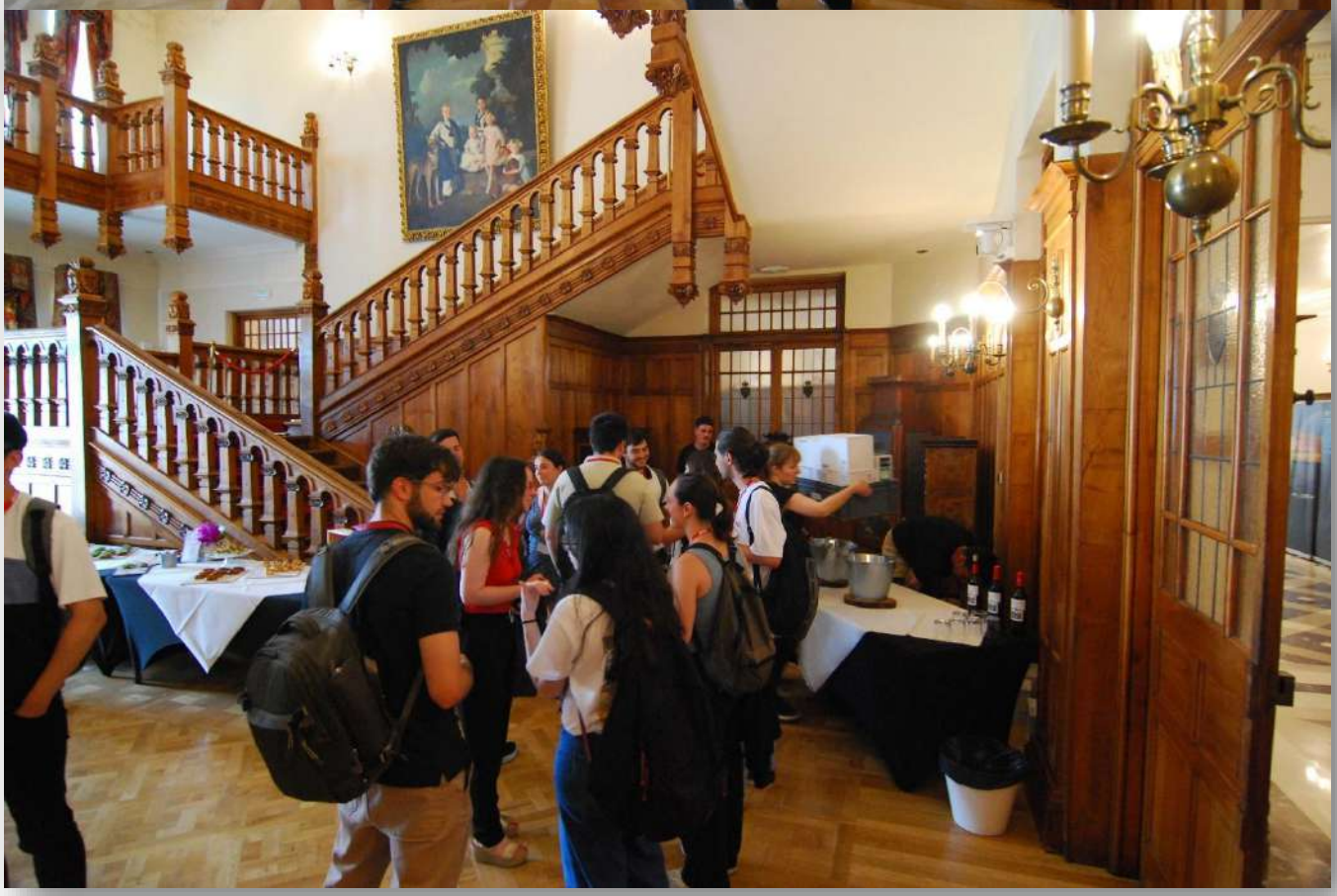

International School on Light Sciences and Technologies (ISLiST)

June 16-20, 2025, Santander, Spain

Core: ***Light in Energy, Environment and Laser Manufacturing***

Figures 78-91.- Distended and networking moments during the Santander council Reception at the Royal Hall and its terrace at the Magdalena Palace venue of VIII-ISLIST at UIMP.

5. Round Press on clean-energy and light-based technologies

Taking into consideration the light-based technologies in the production of clean energies and also the blackout happens very recently in Spain, Portugal and some part of south France (up to this current time without clear explanations) it was consider opportune to realize a round-press to contribute the awareness of the need of green energies and also the clarification of the mentioned success.

Figure 92.- The invited lecturers Javier **Cavada Camino** and Antonio **Gómez Expósito** and the Director of VIII-ISLIST *José Miguel* ***López-Higuera*** speaking and answering question from the attendee reporters in the UIMP *press-room at the Magdalena Palace.*

Because the above mentioned, appeared in the round press room of the UIMP the invited lecturers of VIII-ISLIST Antonio Gómez-Expósito, Javier Cavada Camino and also the director of the international summer school, José Miguel López-Higuera.

After the introduction of the round press invited speakers the director of VIII-ISLIST spoke about the aim of the international school remarking that by changing the core of each consecutive editions the PhD students that are the professionals that will have relevant roles in the developing of the organizations, of the coming world have the opportunity of to take knowledge, technique and experience form more than 45 highly reputed researchers and professional on the topics programed at ISLIST. He also emphasized the key role of Photonics for the development of the organizations along the XXI century.

Dr. Cavada

Then, he exposed that the daily electric energy that helps our lives is, really, a mix of energies produced using several different technologies (eolic, photovoltaic, nuclear, etc.), and the "harmonic" mixture is key in order to avoid troubles such as the recent blackout. After emphasizing that more than 50% will come from solar light, he gave the word to Dr. Cavada. He, firstly, remarked the relevance of the ongoing UIMP courses at the Magdalena Palace and, specifically, the high quality and usefulness of the ISLIST 2025 event. Then, he stated that, in the current times, there is a tremendous need for technology and a tremendous need for electricity that allows us to have the kind of life we enjoy and aspire to. Without it, none of the plans, dreams, and ideas we have as a human race are possible. At the same time, we must care for nature so that our development as a society is sustainable. This implies the decarbonization of processes, which requires electrifying processes that are not currently electric. It is necessary to transfer processes based on fossil fuel industries to other technologies that do not produce emissions harmful to healthy life on the planet, he added. He also stated that at the beginning of the 21st century, it was said that the planet's consumption would double in 30 years due to population growth; right now, we are aware that it will double in less than 10 years. This is not only because the population is increasing, but because quality of life standards continues to rise, and to satisfy this demand without harming the planet, more energy is required: cleaner, of higher quality, and more reliable, he added.

Then, Professor Gómez offered a nice overview and enthusiastic statement in favor of the Photovoltaic energy that, with the advance of technology and massive deployments, is playing and will play a relevant role in the energetic mix. He also emphasized that with the advent of the more and more increasing reliance on renewable energies in the mix, the need for more modern and advanced technologies is imperative, both in the energy networks and their smart and automatic control. He considered the Australian case as a "lighthouse" whose experience must be taken into account, among other ones.

Prof. López-Higuera

Then questions and comments raised by reporters were properly answered. Among then, can be recalled the interest showed by the reporters concerning the technical reasons that explain the mentioned blackout and also concerning the more convenient technology (electric, hybrid, combustion,..) for new cars in Spain. Both were properly replied to. Professor Gómez offered the explanation about the blackout, and Dr. Cavada defended the electric cars. He mentioned that the latter are integrated by a much lower number of components than the combustion ones and that it is expected that they will be very cost-competitive when the batteries cost will be significantly reduced, a statement fully supported by all members of the table. Having replied to all raised questions and comments, the round press was concluded. (For more details you can see the video of the press roundtable, without any editing work) at: https://vimeo.com/1093513567?share=copy#t=564.48

6.-VIII-ISLIST Opening, Closing remarks and Diploma Delivery

The opening ceremony was presided by the Rector/Chancellor of the International University Menendez Pelayo Prof. **Carlos Andrada**s, 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. He also spoke about the general vision and mission of UIMP the university of universities.

The VIII ISLIST Director, Professor López Higuera, spoke on the relevant role of Light Sciences and Technologies (Photonics) in the 21st century. Then he justified the creation of ISLIST within the frame of UIMP that runs the third or fourth week of June of every year with a different core. Then, he offered an overview of the previous ISLIST editions. After that, the Director of VIII ISLIST presented the panel of top-level international invited speakers for the ISLIST 2025 edition with the core Light on Energy, Environment and Laser Manufacturing. Then, he introduced the schedule of activities planned to develop this international Summer School 2025 edition.

Figures 96.-General view of the Opening Ceremony of VIII ISLIST presided by Prof. ***Carlos Andradas****, Rector of UIMP. Photo Courtesy of UIMP.*

Figures 97&98.-Rector of UIMP,Prof. ***Andradas*** *and Director of the VIII-ISLIST, Prof.* ***López-Higuera*** *in two moments in their interventions along the Opening Ceremony. Photo Courtesy of UIMP.*

The ISLIST director explained how the school was planned to be developed along the week, including the special and exceptional events included in the program. He also presented the statistics concerning the participants on the school and concluded with words of acknowledgement for the Sponsors and Collaborators, with special thanks to all the Invited Speakers selected among the worldwide leading authorities in their respective matters. He added special mentions to the secretary of the international school, María Ángeles Quintela at the University of Cantabria, and also to Beatriz Moreno, the technician allocated to this school by UIMP.

During the **Closing Ceremony** Prof. Lopez-Higuera director of ISLIST shared with the attendees his satisfaction with the contribution of ISLIST to reach, without any debt, the objectives of the UIMP (university of universities) of to be, really, an international university inside what top quality science and technology is shared to contribute to the advancement of world organizations and societies. The panel of speakers and attendees (from over 20 different nationalities) in real terms, corroborate his words.

Then, he offered an overview of the development of the eighth ISLIST edition. Illustrating his words with some slides created along the week, he remarked that the discussions and suggestions actively shared among all during the two roundtables programmed to identify, analyze, and discuss challenges to face on both areas of the core were very educative.

"*All of you have had the opportunity to chat, share your views, and network in that informal and relaxing environment that took place during the Santander Council Reception at the Royal Hall last Wednesday, right after the Family Photo*", he added.

Finally, he thanked all invited Speakers, Sponsors, and Collaborators because they are a key part for the feasibility of this meeting. "*Without them, this top-quality School and the International Students*

Figure 99.- The ISLIST ´ Director and Secretary during the Concluding Remarks and announcement of the ISLIST 2025.

Grants would not be possible," he added. Special Thanks to the School's secretary María Ángeles Quintela and Beatriz Moreno, and the rest of the staff of UIMP for the support given during the organization and also throughout the week.

Finally, the director of the school declared the VIII ISLIST closed and announced the Ninth International School on Light Sciences and Technologies for next year, 2026. The IX ISLIST will have its Main Core on **Light on Health and Medicine**. It will be developed during the week of June 15–19, 2026.

Official Diploma delivery ceremony

It must be considered that VIII-ISLIST (**2.5 ECTS credits**) is eligible for recognition as continuing teacher training for teaching staff at centers that provide the courses regulated by Organic Spanish Law 2/2006 on Education, based on Articles 21 and 29 of Order EDU/2886/2011, of October 20, which regulates the call, recognition, certification, and registration of continuing teacher training activities. Therefore, the **official certification** of having successfully participated in the activities of the International Summer School is relevant for the participants. Because of that, and as part of the Closing Ceremony, the personalized Official Diploma was delivered to the participants of the VIII ISLIST who met the UIMP requirements for it. The VIII-ISLIST Secretary proceeded to call attendees in blocks (following alphabetical order) to whom a group of guest speakers, the Director of ISLIST, and several invited speakers delivered the Diplomas to their corresponding recipients. Here are some samples of attendees holding their Diploma.

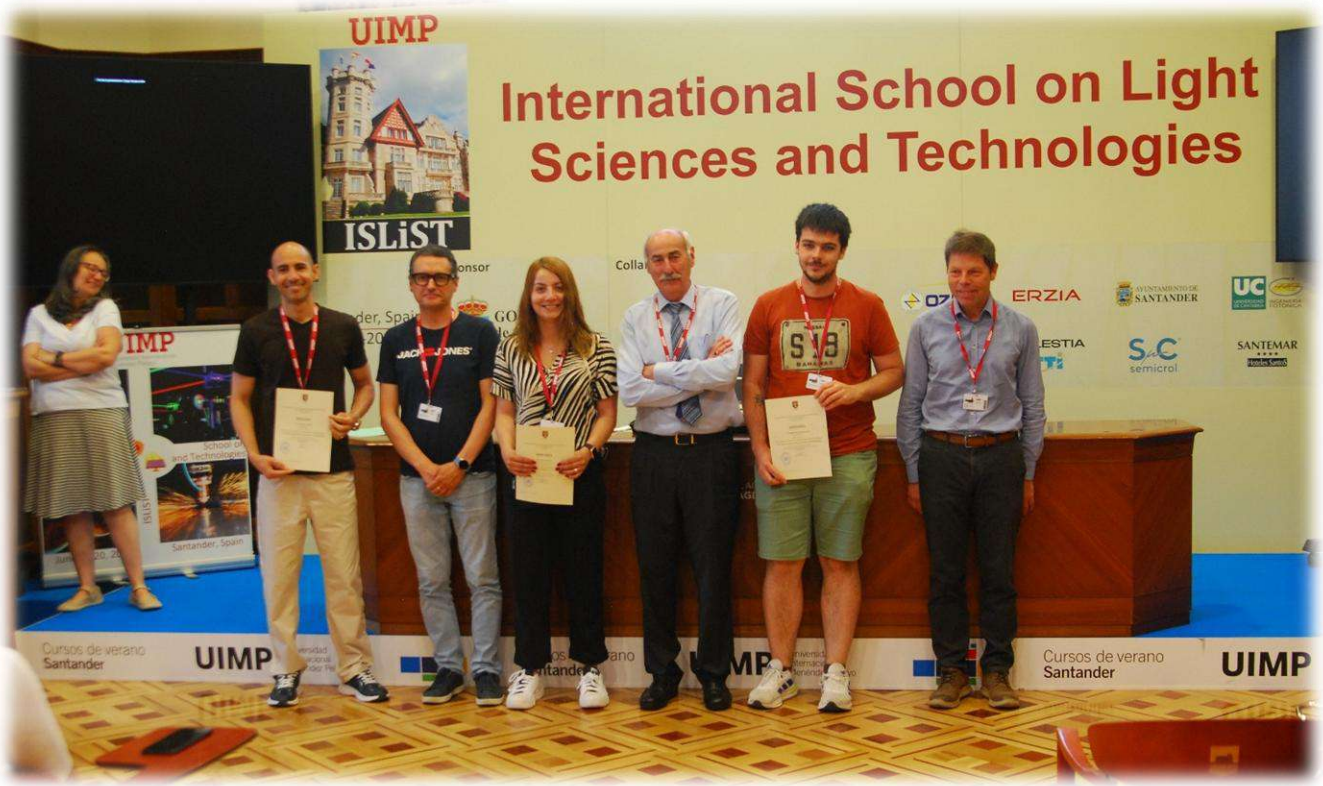

Figure 100.- The first three ISLIST ´Students that received their specific diplomas.

International School on Light Sciences and Technologies (ISLiST)

June 16-20, 2025, Santander, Spain

Core: ***Light in Energy, Environment and Laser Manufacturing***

International School on Light Sciences and Technologies (ISLiST)

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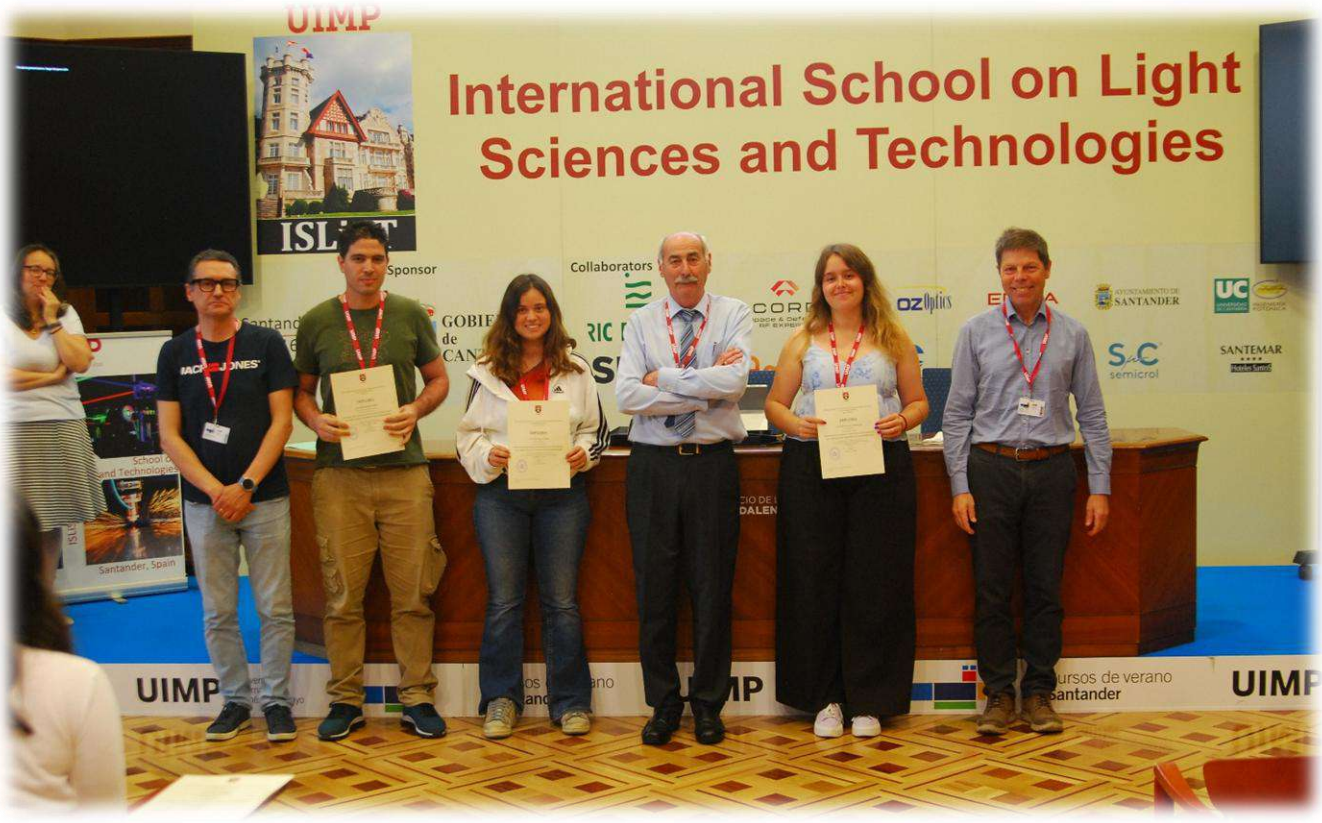

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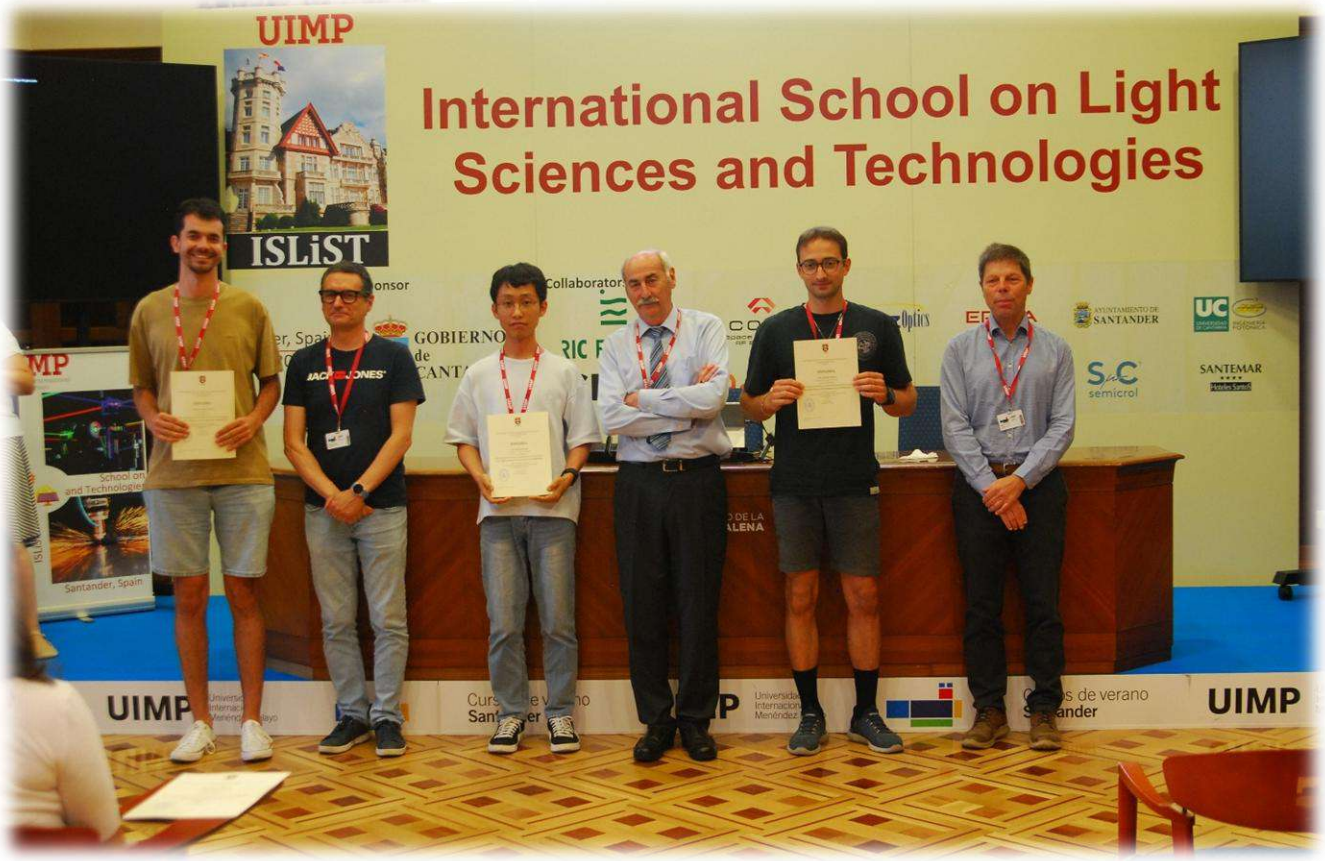


Figure 101-113.- Three ISLIST ´Students after the receiption of their specific diplomas.

7. 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
1 - Poor
2 - Average
3 - Good
4 - Very good
5 - Excellent!

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

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

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

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

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

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

***Q5**-Would you attend future editions if possible?*

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

***Q7**-Finally, did the school meet your expectations?*

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

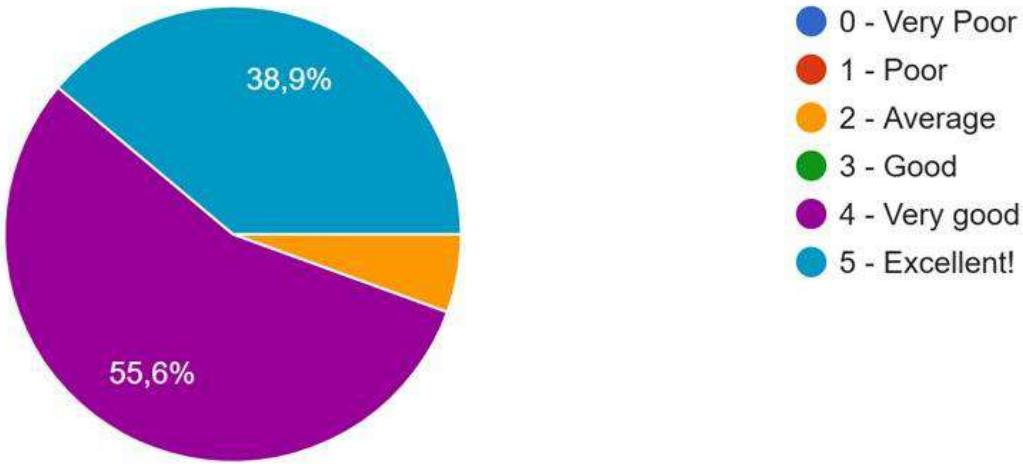
***Q8**-Please, tell us about the best things of the school (what we should go on considering in future editions)*

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

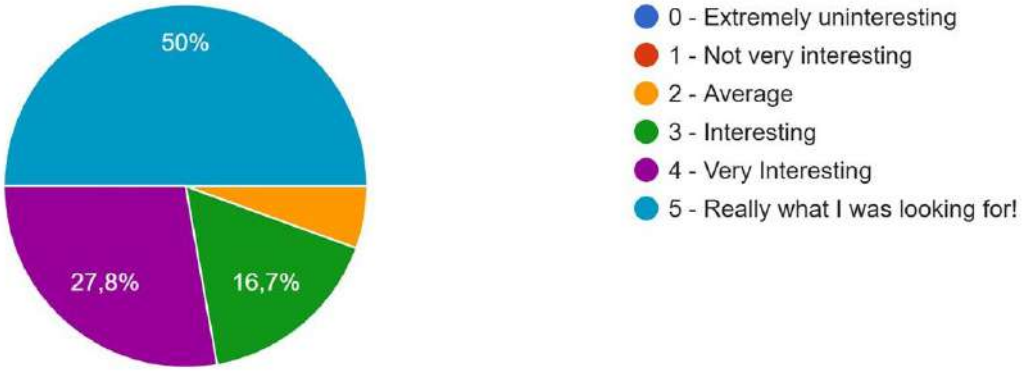
***Q10**-Do you have any suggestions, comments ...?*

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

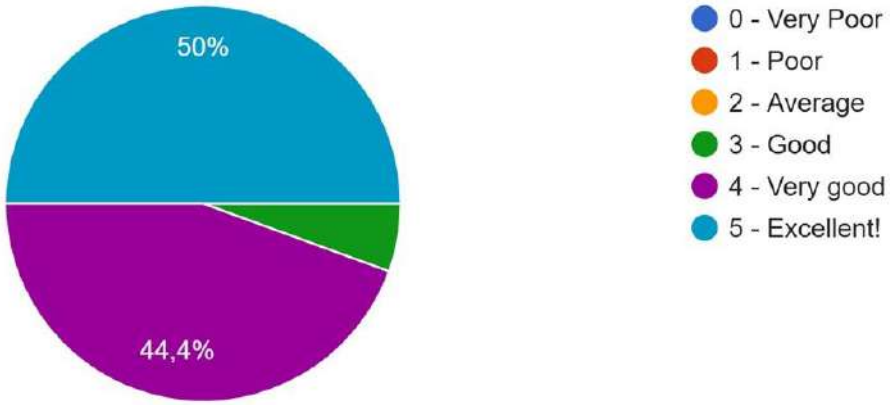
Q1-Please indicate your overall opinion regarding the quality of the invited speakers



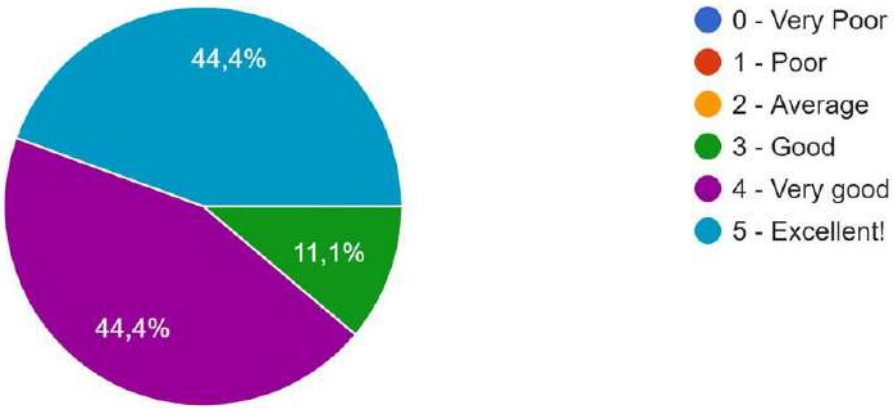
Q2-Please indicate your overall opinion regarding the topics of the talks



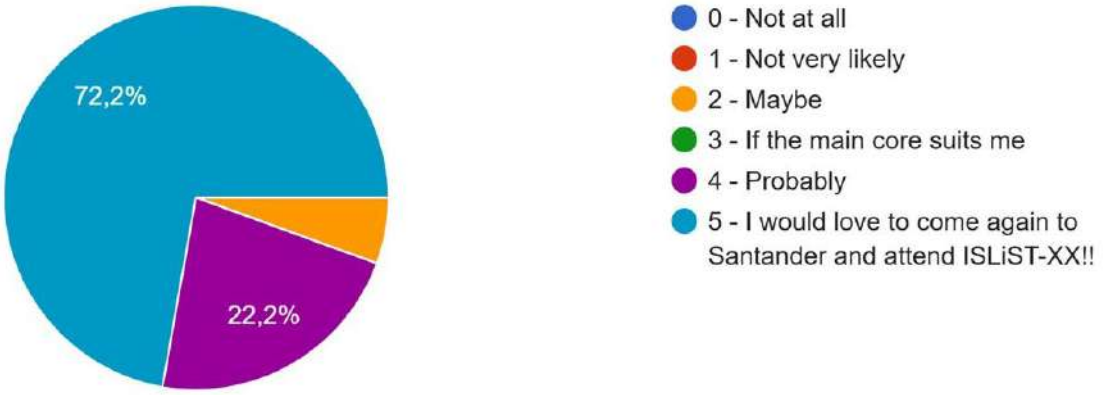
Q3-Please indicate your overall opinion regarding the ORGANIZATION of the school



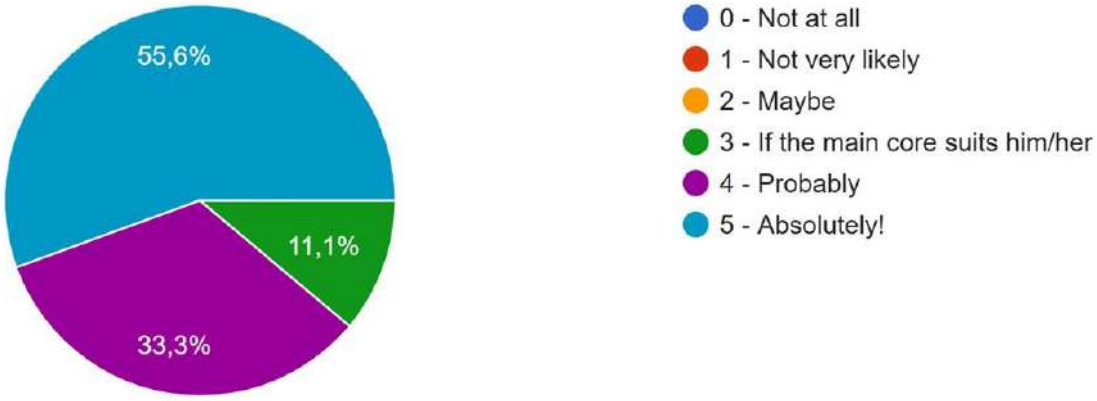
Q4-Please indicate your overall opinion regarding the INFORMATION that you received before attending the school



Q5-Would you attend future editions if possible?



Q6-Would you recommend ISLiST to other colleagues?



***Q7**-Finally, did the school meet your expectations?*

8.- Comments and suggestion to improve ISLIST

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

Here, are the replies as they were received:

- The location is amazing, but the content was only partially related to my PhD topic. That is why I didn't find it very interesting for me.
- Invited speakers were well-qualified people in the area of chosen topics, location and organization was amazing.
- The high quality of the invited speakers and the scientific program. The venue at Palacio de la Magdalena was outstanding.
- Interaction with PhD students and accessible speakers.
- Excellent content and location.
- International speakers and well-structured format.
- Location and academic atmosphere.

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

Here, are the replies as they were received:

- Everythig started well, but by the end of the week, due to the beginning of other courses, some chairs and even the rear screen were removed from the room. As a result, by the end of the course there were problems seeing presentations from the back.
- The bedrooms in las llamas are very humid. That is a little bit annoying i you are sensitive to this.
- Podría haber café. En algunas charlas faltaban sillas.
- Very little free time to enjoy Santander.
- Some sessions were too long for the daily schedule.
- Only one bus schedule, no return transport.

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

Here, are the replies as they were received:

- Maybe broader range of topics
- Consider shorter lectures (45 minutes instead of 1 hour).
- Organize longer social activities for networking.
- Keep the high standard. Consider quantum technologies in future editions.
- Provide proper coffee and snacks during breaks.
- Add return buses at key times.

9.- 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. This is confirmed by the highest quality of the lectures from the best experts (**including Nobel Prizes such as Andre Geim, Shuji Nakamura, and Donna Strickland**) of the most renowned institutions and organizations in the world in the use of Light Sciences and Technologies, together with the numerous and highly qualified international participants. ISLIST was founded and is, since then, directed by José Miguel López-Higuera, who has been assisted in this edition by María Ángeles Quintela, both of the Photonics Engineering Group of the University of Cantabria, CIBER-BBN, and IDIVAL.

VIII ISLIST hosted 58 attendees from 17 nationalities and from more than 20 different institutions, gathering in the week of June 16 to 20, 2025, in Santander, Spain. The VIII-ISLIST participants (74% PhD students and 37% female) received knowledge and experience from 18 reputable professors and professionals from the most reputable academic and research institutions and companies of 9 different nationalities. They had the privilege of receiving top-quality inputs from Christian Sattler, César Vidal, Antonio Gómez Expósito, Pierluigi Mancarela, Ivan Gordon, Jordi Martorell, John Edwards (in the name of Mike Campbell), Carlos Algora, Carlos Molpeceres, Christophe Caucheteur, Tong Sun, Miguel González, Christian Pedersen, and JM López-Higuera. They also received the expertise of reputable professionals and researchers such as Javier Cavada, José Luis Moya, and Mikel Bengoa.

Very hot topics in the use of light sciences and technologies within the Energy, Environment, and Laser Manufacturing sectors were presented and discussed during the 16 one-hour lectures, two half-hour talks, and two round tables. The round tables focused on the search for challenges and opportunities pending in Light Energy (Round Table I) and in Environment and Laser Manufacturing (Round Table II). The fresh and enthusiastic questions and discussions among the participants and the panelists of the two round tables were also unforgettable.

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

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

According to the quality of the program, the speakers, the complementary events, and the facilities offered, the post VIII-ISLIST survey indicates that this international summer school has met its expectations, being considered at the top level worldwide. As numeric indicators, it can be considered that more than 94% of the attendees agreed with the very high quality of the invited speakers, with 55% rating them in the rank of excellence. More than 77% of the students mentioned that the topics of the talks were very interesting and what they were looking for. Finally, more than 88% of the attendees expressed that they would be very happy to recommend IX-ISLIST to other colleagues, and 94% indicated 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)

June 16-20, 2025, Santander, Spain

Core: ***Light in Energy, Environment and Laser Manufacturing***

ANEX

PROGRAM

Monday, 16

Morning
10:15 h
Opening Ceremony

10:40 h / **Break**

Opening Scientific Session

11:00 h Invited Opening Lecture I

The pillars of the decarbonization: impact on the development of a New world
Dr. Javier Cavada
President and Chief Executive Officer, CEO, Mitssubishi Power for Europe, Middled East and Africa.

12:10 h / Invited Lecture II

Concentrating Solar heat for power generation and chemical processes: current trends
Prof. Christian Sattler
Head of Solar Chemical Engineering German A. Center, Germany

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

Afternoon: Light in Green and Blue H2 generation & Photovoltaics

15:30 h / Invited Lectures III

GREEN and BLUE H2 production in Cantabria:

Besaya H2 project
Mr. José Luis Moya Jiménez
CEO Ric Energy, Ric Energy-Copsesa consortium, Spain

Bahia H2 Offshore project
Prof.César Vidal
Emeritus Professor of UC at IH Cantabria, Supercluster Atlantic Wind, SAW, Spain

16:40 h / Invited Lecture IV

The photovoltaic revolution: from the fire age to the light age
Prof. Antonio Gómez Expósito
Director of "Endesa Red" Chair, University of Sevilla, Spain.

Tuesday, 17

Morning: **Light in Energy: Photovoltaics**

9:30 h / Invited Lecture V

Running a net-zero PV-based grid in 2025: modeling and experiences from the Australian "real-wold lab"

Prof. Pierluigi Mancarela

Australian Director of USA-UK-Australia Global Centre in climate change and Clean Energy co-lead with Johns Hopkings university (USA) and Imperial College London, UK.

10:40 h **/ Break**

11:00 h / Invited Lecture VI

Photovoltaic Solar Cells technologies: Currents, Challenges and Opportunities

Prof. Ivan Gordon

Head of Photovoltaic Technology and Energy Systems group, *Interuniversity Microelectronics Centre*, Belgium.

12:10 h / Invited Lecture VII

Nano-photonics to raise the upper limit for Energy Conversion in solar cells.

Prof. Jordi Martorell

Group Leader, Organic nanostructured Photovoltaic, ICFO; Spain.

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

Afternoon

15:30 h- 17:35 / **Round Table I**

Light in Energy: Challenges to face and Opportunities

Dr. Javier Cavada, President and CEO, Mitssubishi Power for Europe, Middled East and Africa, UK
On technological challenges faced by Mitsubishi power on the decarbonization road-map

Prof. Christian Sattler, Head of Solar Chemical Engineering German A. Center, Germany
on using concentration solar power for green fuels real production

Prof. Pierluigi Mancarela, Australian-Director of USA-UK-Australia Global Centre in climate change and Clean Energy.
to reach effective and efficient Energy Storage Technologies

Prof. Gómez Expósito, Director of "Endesa Red" Chair, University of Sevilla, Spain.
for the Stability and Resilience of the electric power system with massive penetration of renewables.

Moderator: Prof. JM López-Higuera, Director ISLIST

Wednesday, 18

Morning: Innovative light-based technologies for energy

9:30 h / Invited Lecture VIII

Perspectives on Inertial Fusion Energy: Opportunities and Challenges

Prof. Mike Campbell

President MCM Consultants, Director Emeritus, Lab. For laser Energetics (LLE), University of Rochester, NY, USA

10:40h / **Break**

11:00h / Invited Lecture IX

Photovoltaic laser power converters for Power-by-light Systems.

Prof. Carlos Algora

Head of III-V Semiconductors Group, UPM, Spain

12:10h / Invited Lecture X

Laser Technology in Photovoltaics

Prof. Carlos Molpeceres

Director, Laser Institute, UPM, Madrid, Spain

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

Afternoon: Light technologies for fabrication and sensing batteries

15:30-16:30 / Invited Lecture XI

Laser Technology in Advanced Batteries Fabrication

Mr. Mikel Bengoa

General Director, Coherent Rofin, Spain.

16:40h / Invited Lecture XII

Multimeasurand Advanced Optical fiber Sensor systems for real time Battery Monitoring

Prof. Christophe Caucheteur

Head, Advanced Photonic Sensors Unit,University of Mons, Belgium

17:55 h **VIII 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.

Thursday, 19

Morning: **Light sensing for energy and environment**

9:30h / Invited Lecture XIII

Monitoring wastewater treatment infrastructure using optical fibre sensors

Prof. Tong Sun

Director of Instrumentation & Sensors Research Centre, City-University of London, UK

10:40h / **Break**

11:00h /Invited Lecture XIV

Fiber Distributed Sensing on Energy and Environment applications

Prof. Miguel González Herraez

Head of Photonic Engineering Group, University of Alcala de Henares, Spain

12:10h / Invited Lecture XV

AI assisted aquatic LiDARs for remote sensing of the ocean

Prof. Christian Pedersen

Head of Optical Sensor Technology Group, Technical University of Denmerk

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

Afternoon

15:30h- 17:35h / **Round Table II:**

Optical sensing technologies for energy and environment

Challenges to face and Opportunities

Prof. Tong Sun, Director of Instrumentation & Sensors Research Centre, City-University of London, UK
in optical sensing technologies for environmental applications.

Prof. Pedersen, Head, of Optical sensor Group, technical university of Denmark
Multimodal LIDAR based sensing technology to monitorize underwater life

Prof. Molpeceres, Director, Laser Institute, UPM, Madrid, Spain
on laser manufacturing

Prof. Miguel González, Head of Photonic Engineering Group, University of Alcalá de Henares, Spain
to reach reliable fiber distributed sensors for Energy and environment

Moderator: Prof. JM López-Higuera, Director ISLiST

International School on Light Sciences and Technologies (ISLiST)

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Core: ***Light in Energy, Environment and Laser Manufacturing***

Friday, 20

Morning/Special session: **Light in sensing for environment and energy**

9:30-10:40h / Invited Lecture XVI

Atmospheric LIDAR sensing for a green transition

Prof. Christian Pedersen

Head of Optical Sensor Technology Group, Technical University of Denmerk

10:40h / **Break**

11:00-12:10h / Invited Closing Lecture XVII

Cleaning environments with energetic photons

Prof. José Miguel López-Higuera

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

12:15 h

Closing Remarks, Announcement of IX-ISLIST, 2026, and Diploma Delivery

The UIMP official diploma will be delivery to each attendee by VIII-ISLIST invited speakers.