



NEWSLETTER

COMMISSION INTERNATIONALE D'OPTIQUE • INTERNATIONAL COMMISSION FOR OPTICS

Nanophotonics against Covid-19

CoNVat project is one of the first projects funded by the H2020 European Union program to fight against COVID-19



Prof. Laura Lechuga is the leader of the Nanobiosensors and Bioanalytical Applications group at the Catalan Institute of Nanoscience and Nanotechnology.

The dramatic spread of COVID-19 pandemics has evidenced the urgent need of novel diagnostic tools for the rapid and reliable testing and screening of the population. Current diagnostic PCR techniques provide the required sensitivity and specificity but its relatively long time-to-result, and the need of specialized technicians and laboratories, delays overly the massive detection. To surpass this bottleneck it is essential to have reliable, fast and user-friendly diagnostics tests than can be employed at the point-of-need. Photonic biosensing technology is one of the best prepared to tackle this challenging goal.

CoNVat project, funded by the EU, will deliver a new biosensor platform based on nanophotonics capable to provide an accurate and fast COVID-19 diagnosis without requiring complex equipment. The Catalan Institute of Nanoscience and Nanotechnology (ICN2, Barcelona, Spain) leads and coordinates the project in collaboration with other three European partners. Its main objective is to deliver a Point-of-Care Nanophotonics Biosensor platform capable to provide an accurate and fast SARS-CoV-2 coronavirus detection (in less than 30 minutes), without requiring complex equipment and directly from the human sample.

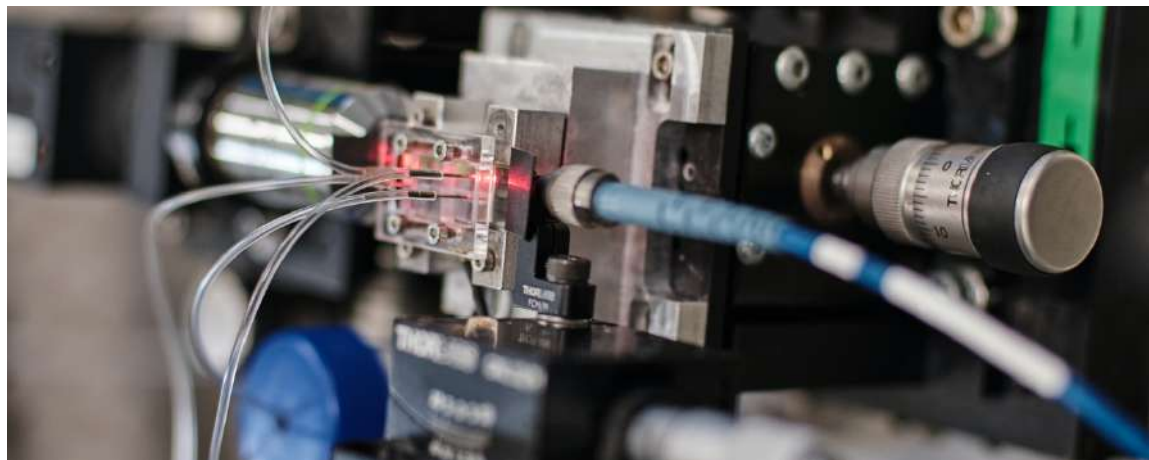
CoNVat makes use of a new type of silicon photonic sensor based on bimodal waveguide interferometers (BiMW), a proprietary cutting-

edge nanophotonic technology previously developed by ICN2 and CSIC. In the BiMW interferometer, two modes of a monochromatic light in the visible range travels along a straight microscopic waveguide under a TIR regime, generating an evanescent electromagnetic field with penetration depths around 200 nm, employed as biosensing probe.

The bimodal waveguide interferometer stand out for their broad dynamic range and exceptional sensitivity, reaching detection limits in the range of 10^7 - 10^8 RIU, allowing the direct, ultrasensitive, label-free and quantification of specific targets. This biosensor technology is also prone to miniaturization and multiplexing as is fabricated in photonics chip circuits of silicon nitride waveguides, which together with a lab-on-chip microfluidics integration reduces the sample volume and the time-to-result.

The CoNVat biosensor device incorporates specific antibodies onto the sensor surface to capture complete units of the SARS-CoV-2 virus. This capturing process is monitored in real time making possible the rapid diagnosis of the infection and the quantification of the viral load. The biosensor device will also include complementary DNA probes that will hybridize to exclusive sequences of the RNA in the SARS-CoV-2 virus.

Prof. Laura Lechuga
CoNVat Project leader



The simplicity of the BiMW design, based on a common path waveguide, makes the BiMW sensor attractive for mass production since there is no need to use light splitters.

RIAO Council Celebrates its 10th Anniversary

RIAO stands for Ibero-american Optics Network (Red Iberoamericana de Óptica, in Spanish).



Prof. Manuel F. Costa from Universidade do Minho (Portugal) is the current President of RIAO

The international visibility of the Ibero-American optics community has increased significantly during the last three decades and the decisive importance of Ibero-America's contribution to the development of Optics and Photonics is widely recognized.

A large number of Ibero-American optics and photonics researchers and scholars are among the worlds' most renowned ones. Annually members of the Ibero-American optics community are awarded with the most prestigious international prizes. Several serve optics and photonics, with enthusiasm and acclaimed competence, as president vice-president secretaries or top officers of all major international scientific societies including at ICO, that RIAO proudly and actively serves as International Society Member. A vibrant and growing community of optics and photonics Ibero-American students working at the region and all over the world are the guarantee of a bright future for the Ibero-American optics.

Among the reasons for this positive development is the rapid growth of research and teaching of optics and photonics in the region. This development of optics allowed and profited from the establishment of a large number of fruitful collaborations between Ibero-American research laboratories and higher education institutions and renowned international counterparts from all over the world. The mutually beneficial exchange of students and researchers further facilitated the growth and

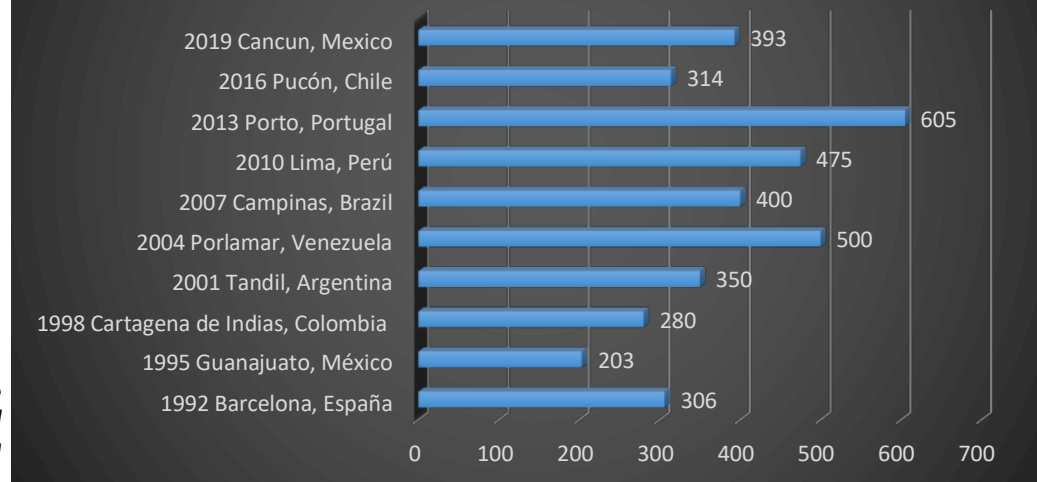
development of the Ibero-American optics community.

The region witnessed the creation and strong development of a good number of national and transnational scientific societies and other organizational structures of the optics scientific communities that actively and effectively promote the development of optics and photonics in their countries and region. The cooperation between national organizations of Ibero-America, including in the frames of the International Commission for Optics territorial committees, increased significantly along the years strengthening each other.

In the mid-eighties the 1st OPTILAS Latin-American meeting was organized and in 1992 the first triennial Ibero-American Optics Meeting (figure 1) was organized in Barcelona, Spain. Back in 1998 in Cartagena de Indias, Colombia, under the auspices of the International Commission for Optics, both meetings were merged marking the beginning of the process of establishing a major transnational organization embracing all the Ibero-American Optics community.

The RIAO, Ibero-American Optics Network, was established in August 2008 and ten years ago during the VII Iberoamerican Optics Meeting & X Latinamerican Meeting on Optics, Lasers and Applications, RIAO/OPTILAS 2010, in Lima, Peru, its first Bureau was officially installed under the ad-hoc presidency of Dr. Eric Rosas.

Attendance - RIAO and RIAO/OPTILAS meetings



Evolution of the attendance at the flagship and reference international conference of the Ibero-American Optics community, RIAO/OPTILAS.



Group photo upon the investiture of the first Council of RIAO at the RIAO/OPTILAS'2010 meeting in Lima, Peru. From left to right: Pedro Andrés (Spain's councilor), Efraín Solarte (Colombia's councilor and ah doc secretary), Eric Rosas (México's councilor and ah doc president), Katarina Svanberg (SPIE president), José Luis Paz (Venezuela's councilor), María Luisa Calvo (ICO president), Angela Guzman (ICO secretary), Manuel Filipe Costa (Portugal's councilor) and Guillermo Baldwin (chairperson of RIAO/OPTILAS'2010).

According to its Bylaws, the Ibero-American Network for Optics, RIAO, is a supranational organization that strives to improve communication and strengthen collaboration between researchers, teachers, students and technical professionals in the field of optics and related disciplines in Ibero-America. For this purpose, the RIAO promotes and facilitates activities that contribute on an ongoing basis to the development of pure and applied optics in the region. RIAO gives to the Ibero-American community the possibility to have a single open progressive and inclusive voice towards the rest of the World and to act as a valid Ibero-American representative. The network is organized as a set of Ibero-American territorial organizations on Optics. The RIAO is governed by its Council, which is composed by the President, the Secretary, and a representative from every member country of the region. The designation of each national RIAO councilor is responsibility of the national optical associations already integrated to the RIAO and is done according to the internal procedures stated by their respective communities. The RIAO bylaws are currently signed by national representatives from Argentina, Colombia, Cuba, Ecuador, Mexico, Portugal, Spain and Venezuela. Many potential benefits arises from a solid Ibero-American network, i.e.: the organization and support of supranational workshops training courses summer schools and conferences among which the Iberoamerican Optics Meeting, RIAO/OPTILAS, have steadily grown establishing itself as the major reference scientific meeting in optics and photonics in

Ibero-America and one of the most relevant meeting worldwide in field (figure 1.); benefits awarded to members of a national society integrated in the RIAO (e.g., fee reduction, participation in regional prizes and awards, etc.) are extended to the individuals of the rest of affiliated societies; the exchange of teaching and research experiences; the broadening of Ibero-American networking; the promotion of friendly and effective collaboration among the whole community and abroad; and, maybe most importantly, to have a single positive and affirmative voice towards the rest of the worldwide optics community promoting Optics and photonics and its paramount importance to the sustainable development of our societies.

In the last years, we have placed special emphasis on the engagement of the whole Ibero-American region with RIAO through support and constructive exchange of ideas and dialog with the existing regional optical societies or even the promotion of new ones in those countries without a specific scientific association. In this sense, we would like to stress the recent incorporation of Ecuador and Argentina and the foreseeable next incorporation of other countries. Some exploratory or preliminary discussions have been held with representatives of Uruguay, Panama, Peru, Chile, and Brazil and we are looking forward to have an even stronger Red(e) Iberoamericana de Óptica.

Prof. Manuel F. Costa
RIAO President
for the term 2019-2022

Words of Hope from Optics Within Life Sciences

Alexander Heisterkamp is Secretary General of OWLS



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While the virus is still spreading in many parts of the world and most countries installed measures to “flatten the curve”, we as an optics community might wonder, what our special contribution to the crisis can be. Certainly, an optics researcher is not as close to the frontline as medical staff and doctors, who fight the pandemic at its heart. However, many of the diagnostics measures these people rely on are based on optical technologies. Therefore, we as the chairs of the coming ICO-25-OWLS-16 congress decided, to encourage you to share and present your research related on “Optical Technologies Fighting Infectious Diseases”. In the current crisis, our society is facing several challenges, for which optical technologies might contribute to their solutions:

One fundamental basis for a successful fight against the corona virus is reliable, widespread testing. Although several suitable tests are available and being used, the current technologies certainly can still be optimized, as for example testing not only needs to be reliable and accurate, but fast, affordable and ideally worldwide available for mass testing. Like in many other fields, optical technologies might provide compact and easy to use tools for testing, not relying on sophisticated laboratory equipment and, thus, allowing widespread and repetitive testing even in developmental countries. Using optical sensors, single virus detection has previously been demonstrated, opening possibilities for a much more direct test, without laborious RNA isolation and amplification. Further testing possibilities are antibody-based tests, screening for IgG and IgM antibodies.

Although most of the research and development regarding antibody testing lies in the field of molecular medicine, optical readout and plasmonic technologies might still be further advanced and thereby offer more reliable or faster testing. And lastly, this pandemic outbreak surely demonstrated, how quickly diseases can spread in our world. Suitable screening technologies, like thermographic imaging at airports and AI-supported diagnostics tools can offer solutions to prepare for future challenges.

The main theme of ICO-25-OWLS-16 is “Progress of Society with Light” and we hope our general world congress in September 2021 can support our society to further achieve progress in fighting the corona virus.

We will be looking forward to welcome you at our conference in Dresden, Germany, and additionally celebrate our special commemorative event of the 30 years anniversary of the foundation of OWLS, - the Optics within the Life Sciences-, in Germany 2021. ICO-25-OWLS-16 world congress will include a new topical slot on “Optical Technologies Fighting Infectious Diseases”. The General Chair, Prof. Juergen Czarske, has pointed out there are opportunities for submitting research paper on SARS-CoV-2 to principally all topics of ICO-25-OWLS-16.

**Prof. Alexander Heisterkamp
International Program Committee
Chair of OWLS-16**

Forthcoming events with ICO participation

Due to the international covid-19 crisis, updates on the pending events sponsored by the International Commission for Optics will be updated in the ICO website: <http://e-ico.org>

Responsibility for the correctness of the information on this page rests with the International Commission for Optics (ICO); <http://www.e-ico.org/>. **President:** Prof. Roberta Ramponi, Director IFN-CNR, Politecnico di Milano, Italy; roberta.ramponi@polimi.it. **Treasurer:** Prof. Joseph Niemela, International Center for Theoretical Physics, Italy; niemela@ictp.it. **Secretary:** Prof. Humberto Michinel, Universidade de Vigo, Spain; hmichinel@uvigo.es. **Associate Secretary:** Dr. Frank Höller, Carl Zeiss AG, Germany; frank.hoeller@zeiss.com

