NATO OTAN

This activity is supported by:

The NATO Science for Peace and Security Programme

NATO Emerging Security Challenges Division
Science for Peace and Security (SPS) Programme

"NANOtechnology inspired biosensor with photo-responsive Liquid Crystals – NANO-LC"

Official launch

Tuesday, 25 August 2020, 1 PM – 3 PM (CEST) – Videoconference

AGENDA

Join Google Meet https://meet.google.com/kyc-hihz-utb

Moderator: Prof. Luciano De Sio – *Sapienza University of Rome, NATO Country Project Director "NANO-LC", Italy*

1:00 PM	Welcome speech	**Prof. Carlo Della Rocca** – *Dean, Faculty of Medicine and Pharmacy, Sapienza University of Rome, Italy* **Prof. Kwang-Un Jeong** – *Head of Department, Polymer-Nano Science & Technology, Jeonbuk National University, Republic of Korea*
1:20 PM	NATO Science for Peace and Security Programme: a common commitment and global challenges	**Dr. Eyup Turmus** – *SPS Advisor and Programme Manager, NATO*
1:40 PM	Introduction to objectives and activities of the project	**Prof. Luciano De Sio** – *Sapienza University of Rome, NATO Country Project Director "NANO-LC", Italy* **Prof. Kwang-Un Jeong** – *Jeonbuk National University, Partner Country Project Director "NANO-LC", Republic of Korea*
2:00 PM	The end-user's perspectives	**Dr. Michael Mcconney** – *Air Force Research Laboratory, USA* **Dr. Dean Evans** – *Air Force Research Laboratory, USA* **Dr. Nicholas Godman** – *Air Force Research Laboratory, USA*
2:20 PM	Project plan presentation and NANO-LC working groups: from kick-off meeting to four milestones	**Federica Zaccagnini** – *Sapienza University of Rome, Italy* **Dr. Yu-Jin Choi** – *Jeonbuk National University, Republic of Korea* **Prof. Daniela De Biase** – *Sapienza University of Rome, Italy* **Prof. Luciano De Sio** – *Sapienza University of Rome, NATO Country Project Director, Italy*
2:50 PM	Debate final remarks	**Prof. Roberto Pani** – *Director of the School of Medical Physics, Sapienza University of Rome, Italy* **Dr. Eyup Turmus** – *SPS Advisor and Programme Manager, NATO* **Prof. Antonella Calogero** – *Head of Department, Department of Medico-surgical Sciences and Biotechnologies, Sapienza University of Rome, Italy*

PROJECT OVERVIEW	
Description	Water distribution systems represent potential targets for terrorist activity because of the need for water in every sector of our industrialized society. The deliberate contamination of water reservoirs or pipes with biological agents such as pathogens or biotoxins might constitute a mass destruction bioweapon. With this in mind, the SPS Multi-Year Project "NANO-LC" aims at investigating a novel nanotechnology-based biosensor specifically utilized for the detection of harmful bacteria intentionally or unintentionally dispersed in potable water. The nano-inspired device makes use of a chemically functionalized gold nanoparticle (Au NPs) array (for the selection of specific pathogens) layered with a photo-responsive liquid crystal (LC) film (for real-time detection) and with a microfluidic circuit. NANO-LC contributes to NATO's strategic objectives by developing a new generation of early warning systems that monitor the quality of source water, thus protecting the consumers and minimizing all the related risks. Moreover, NANO-LC actively promotes practical scientific cooperation between a NATO member (Italy) and a partner nation (Republic of Korea).
Goals	With the vision to improve international security and minimize the risks associated to mass destruction bioweapons, NANO-LC will pioneer a new breakthrough technology aiming at demonstrating the realization of a nanotechnology-based biosensor by synergistic exploitation of chemically functionalized Au NPs and light-responsive LCs. NANO-LC aims at reinforcing international security thanks to the realization of a miniaturized biosensor able to monitor in real-time the quality of drinkable water. If the water is intentionally or unintentionally contaminated with specific harmful pathogens, the proposed device will be able to recognize/quantify the associated risks, thus alerting competent authorities about contamination. This information is essential to save lives and avoid all the related potential economic consequences. The proposed biosensor will be characterized by compactness (few cm^2), real-time monitoring (≈300-400 ms), extremely high sensitivity (few percentage tolerance) and will offer a quantitative (intensity measurement) along with a chemical recognition (color change) of the bio-associated risks. The low cost of the proposed biosensor will make this technology suitable for a variety of contexts.
Expected Results	NANO-LC intends to deliver a truly innovative biosensor with a medium technology readiness level (TRL 4) for the detection of harmful pathogens dispersed in potable water. The strong experience and know-how of the consortium along with the long-lasting collaboration between both NPD/PPD and Air Force Research Laboratory (AFRL) as end-user will be a key factor for the realization of a new technology capable of contributing to international security. The role of the end-user will be crucial not only for assisting the consortium during the research and development process, but also assessing the promise of the proposed technology with an eye towards communicating the results to defense customers to enable pushing the technology towards higher TRLs and potentially manufacturing the sensors. The project promotes collaborative and cooperative applied research based on solid milestones and concrete deliverables for both NPD/PPD and AFRL. NANO-LC proposes an impactful technology for global biosecurity, while training a new generation of experts and passionate young scientists throughout the project, providing them with theoretical and practical knowledge.

PARTICIPATING INSTITUTIONS	
Sapienza University of Rome, Italy	With over 700 years of history, over 113,000 students, 3,300 teachers and 2,000 employees, technicians and librarians, in addition to 1,800 administrative staff in university hospitals, **Sapienza** is the first university in Europe. Its mission is to contribute to the development of a knowledge society through research, excellence, quality education and international cooperation. In this context, five Nobel Prize winners and a large number of internationally renowned scientists have taught and/or studied at Sapienza. Scientific research activity at Sapienza covers an extremely broad spectrum of disciplines, reaching levels of excellence in many areas, including archaeology, physics and astrophysics, humanities and cultural heritage, the environment, nanotechnologies, cell and gene therapy, design, aerospace, social and economic sciences. The **Department of Medico-surgical Sciences and Biotechnologies** (DMSSB) aggregates academics of the Faculty of Pharmacy and Medicine performing their research activity in scientific areas related to diagnostics, medicine, surgery and medical physics. By virtue of the integration of existing research programs in basic and applied sciences with care activity in Health Departments of Latina and Policlinico Umberto I of Rome, academics of DMSSB pursue several lines of research ranging from applied biomedical sciences to surgical sciences. The role of DMSSB is strongly linked to its experience in the field of biotechnologies and advanced medicine. Moreover, in the past two years DMSSB has established an innovative center for Bio-Photonics working at the crossroads between physics, biotechnology and high precision medicine.
Jeonbuk National University, Republic of Korea	**Jeonbuk National University (JBNU)** is located in the historical city of Jeonju, Republic of Korea. As the flagship national university for the Jeollabuk-do Province, it was founded in 1947 by the provincial fund within the framework of the Korean national university system, following the liberation of the country. JBNU is a research-focused educational institution based on materials science, which consist of IT, nanotechnology, bio-technology, and environmental technology, and maintains a close relationship with various universities to perform interdisciplinary collaborative research. They The **Department of Polymer-Nano Science & Technology** has various facilities driven by the resident expertise for strong interactions with the polymer industry and other centers of polymer research. These facilities are engaged in activities ranging from the development of advanced materials and characterization of their materials properties, through methods for their processing, to device prototype development.

ABOUT THE SCIENCE FOR PEACE AND SECURITY (SPS) PROGRAMME

The NATO Science for Peace and Security (SPS) Programme has been contributing to the core goals of the Alliance for more than six decades. It is one of the largest and most important NATO partnership programmes addressing 21st century security challenges, particularly cyber defence, advanced technologies, counter-terrorism, energy security, and defence against chemical, biological, radiological and nuclear agents. As part of NATO's Emerging Security Challenges (ESC) Division, the SPS Programme promotes practical scientific cooperation and capacity-building between researchers, experts and officials from NATO and partner countries. By supporting security-relevant activities in the form of grants for multi-year projects, advanced research workshops, advanced training courses, and advanced study institutes, SPS fosters the creation and expansion of networks of international experts, the sharing of best practices, and the exchange of expertise and know-how among scientific communities in NATO and partner countries.

The Programme involves partners across all of NATO's partnership frameworks (including the Partnership for Peace, the Mediterranean Dialogue, the Istanbul Cooperation Initiatives and cooperations with partners across the globe), through engagements with approximately 2000 experts every year. The Programme also invests in the development of the next generations of researchers, by actively supporting the participation and training of young scientists in its activities. As a testament to the scientific excellence supported by SPS, 21 Nobel Laureates have been involved in its activities since its creation.

The NATO Science for Peace and Security Programme also provides the Alliance with separate, non-military communication channels by bringing together experts from NATO and partner countries, often in situations or regions where other forms of dialogue more focused on defence and security are difficult to establish. Accordingly, the Programme enables NATO to become involved in such regions, often serving as the first concrete link between NATO and new partners, based on partners' request for cooperation.

CONTACTS

For more information, please visit our website at www.nato.int/science and follow us on Twitter at @NATO_SPS

For questions about the SPS Programme, please contact: sps.info@hq.nato.int