Leibniz Universität Hannover

Press release

Team of Hannover Physicists Develops Rapid Mobile Test for the Detection of Toxic Blue-Green Algae

Communications and Marketing

Tel. +49 511 762 5342
Fax +49 511 762 5391

E-Mail: kommunikation@uni-hannover.de

28 August 2020
sm/080/20

Scientists of Leibniz University Hannover (Germany) are part of a research project to achieve significant financial savings in water testing - waterworks, municipalities and bathing lake operators are to benefit

If the water in swimming lakes and ponds turns green in summer, this is often due to cyanobacteria. These microorganisms, also called blue-green algae, can carry some of the most dangerous naturally occurring toxins in the world, cyanotoxins. Children in particular, but also water sports enthusiasts and dogs are at risk from them. Ingestion or skin contact with the blue-green algae can lead to skin and mucous membrane irritation, diarrhoea or fever. For this reason, infested waters are regularly closed. The new joint research project "CyanoBacteria and Toxin Detection (CyBER)" aims to make water bodies safer. The researchers intend to develop a rapid mobile test to detect toxic blue-green algae on location.

The scientific partner of the joint research project is the HOT - the Hanover Centre for Optical Technologies - at Leibniz University Hannover. Prof. Dr. Bernhard Roth, Managing Director of the HOT and Head of the Precision Metrology Task Group in the PhoenixD Cluster of Excellence, says: "In this project, we are transferring optical technologies developed in basic research into practical applications. We are thus enabling innovative and precise measurement technology. In the long term, we envision to realise such complex systems by additive manufacturing, for example, 3D printing. Then we will equip the systems with artificial intelligence and make them available for widespread use. Our research fits well into the PhoenixD cluster of excellence, which is developing the foundations for the digital, individualised optics production of the future".

The company bbe Moldaenke (Schwentinental, Germany), specialised in environmental analysis, coordinates the joint project. Further partners are the Institute for Hygiene and Environment (Institut für Hygiene und Umwelt, Hamburg, Germany), which monitors the region's water resources, and the measurement equipment manufacturer ADM (Krems II, Germany). The project is financed by the funding initiative "KMU-innovativ: Photonik und Quantentechnologie" of the Federal Ministry of Education and Research.

Technically, the researchers intend to combine several optical technologies: fluorescence detection, holography and Raman spectroscopy. The device is thus detecting not only the chemical composition at the molecular level but also determining the shape and position of the objects. The water samples are examined without contact and preparation using optical methods only. The system to be developed will also detect cyanotoxins that have already been formed but not yet released. Furthermore, it will recognise non-toxic cyanobacteria that are capable of

toxin formation at a later stage. "With this innovation, it will be possible to monitor potentially endangered water body areas effectively," says Christoph Wetzel, PhD student and research assistant at HOT. "Our method represents a significant improvement over the current state of the art in science and technology," says Dr. Ann-Kathrin Kniggendorf, whose group at HOT carries out the research.

Dr. Regine Redelstein, head of the Department of Aquatic Biology and Ecotoxicology at the Institute for Hygiene and Environment (Institut für Hygiene und Umwelt, Hamburg), says: "With the technique, the hazard potential of a cyanobacterial bloom can be assessed on site, so that decisions on whether to close a watercourse can be made quicker than before. This would be of great importance for Hamburg, for example, before major events such as the annual Iron Man or triathlon, where people swim in the Alster water resource".

"For my company, bbe, this project is not only an optical quantum leap," says Christian Moldaenke, managing director of bbe Moldaenke, "but also an ecological and economic one. The monitoring and safeguarding of bathing and drinking waters can be carried out in an extremely condensed form. The individual test will only be feasible at a fraction of previous costs". In particular, no specialist personnel will be required for the application. The team sees excellent market potential not only with supervisory authorities and drinking water suppliers but also with aquaculture operators, fishers and operators of bathing lakes.

The PhoenixD Cluster of Excellence

Between 2019 and 2025, the Cluster of Excellence PhoenixD led by Leibniz University Hannover will receive approximately 52 million euros of funding from the federal government and the State of Lower Saxony via the German Research Foundation (DFG). The cluster is a collaboration of TU Braunschweig, Max Planck Institute for Gravitational Physics (Albert Einstein Institute), Physikalisch-Technische Bundesanstalt and Laser Zentrum Hannover e.V. Within the scope of the cluster, more than 100 scientists from the fields of physics, mechanical engineering, electrical engineering, chemistry, computer science and mathematics conduct interdisciplinary research. The cluster explores the possibilities offered by digitalisation for novel optical systems as well as their production and application.

Note to editors:

For further information, please contact Prof. Dr. Bernhard Wilhelm Roth, Managing Director of the HOT - Hannover Centre for Optical Technologies and Head of the Task Group Precision Metrology of the PhoenixD Cluster of Excellence., Telephone +49 511 762 17907, Email: bernhard.roth@hot.uni-hannover.de.