

Measuring turbulence with greater precision

At the recently launched WiValdi (short for “Wind Validation”) research wind farm in the district of Stade on the Elbe, Oldenburg researchers are studying how wind turbines that are positioned close together influence each other. This large-scale research facility run by the German Aerospace Centre (DLR) features two state-of-the-art wind turbines equipped with hundreds of sensors and measuring instruments as well as five meteorological measurement masts. The University of Oldenburg is involved in the project via the Centre for Wind Energy Research (ForWind). Together with the DLR and the Fraunhofer Institute for Wind Energy Systems (IWES), ForWind is a partner in the Research Alliance Wind Energy (FVWE) which is conducting the research at the wind farm. The new facility is funded by the Federal Ministry for Economic Affairs and Climate

Action and the Lower Saxony Ministry of Science and Culture.

At the core of this unique testing area – the only one of its kind world wide – are two conventional multi-megawatt wind turbines with rotor blades reaching up to a height of 150 metres. One of the turbines is positioned in the slipstream of the other, in order to address the key question of how turbulence from the front turbine affects the one behind it. Measurements taken from three masts carefully positioned between the two turbines will provide answers. ForWind was responsible for planning the positioning of the masts and their sensors.

The configuration will enable the scientists to measure the turbulent wind conditions between the turbines at a high temporal and spatial resolution. In addition to wind speed, the measuring devices installed on the

masts record other variables between the wind turbines such as temperature and humidity. The data thus obtained will enable the researchers to conduct a detailed analysis of the meteorological conditions on a vertical surface between the two turbines. Another measurement mast positioned in front of the foremost wind turbine will measure the inflowing wind field. Measuring systems planned and developed by members of the ForWind team at the Universities of Bremen and Hanover are also attached to the towers and rotor blades of the wind turbines.

On the basis of the data gathered in the project the researchers aim to determine whether it is feasible to position wind turbines closer together than is currently the case on wind farms, for example. They also want to learn how to configure them to achieve maximum efficiency for the power grid.

A large crane was used to assemble the huge wind turbines at the research wind farm. The three measurement masts in the background enable scientists to make high-resolution spatial and temporal measurements of the turbulent wind conditions between the turbines for the first time.



Tracking plastic particles

The analysis of the dispersal pathways of plastic waste in the southern North Sea and the development of strategies for reducing this pollution was the focus of a study by an interdisciplinary team of researchers led by scientists from the University's Institute for Biology and Chemistry of the Marine Environment. Citizens in the focus region of the "Macroplastics" project played an important role. A dedicated website was set up so they could report the beaching locations of wooden drifters deployed by the researchers in the open sea and along the coastline. The study showed that there are no permanent accumulation areas in the North Sea and that most plastic particles larger than five millimetres in diameter are quickly washed ashore. The results were published in the journal *Frontiers in Marine Science*. By combining its observations with model calculations, the team was able to obtain an overview of the spatial distribution of litter sources as well as the role played by different sectors such as tourism or industry.

Local species loss may often be underestimated

The number of species in an ecosystem is not a reliable measure of its biological stability: seemingly healthy communities with constant or even increasing species numbers may already be on the path to decline and loss of species, according to a new study. Even in long-term data series, these negative developments may only become apparent with a delay that results from a systematic bias towards earlier detection of colonisations than extinctions. The study was conducted by Dr Lucie Kuczynski and Prof. Dr Helmut Hillebrand from the University's Institute for Chemistry and Biology of the Marine Environment together with Dr Vicente Ontiveros from the University of Girona (Spain). The results were published in the journal *Nature Ecology & Evolution*.

New concept for lithium-air batteries

Lithium-air batteries are candidates for the next generation of high-density energy storage devices as in theory they can store ten times more energy per kilogram than conventional lithium-ion batteries. An inter-institutional project in which a team of researchers led by Oldenburg chemist Prof. Dr Gunther Wittstock is participating in testing a new concept for boosting the stability of these innovative battery cells. The project "Alternative materials and components for aprotic lithium-oxygen batteries: chemistry and stability of inactive components – AMaLiS 2.0" is led by IOLITEC Ionic Liquids Technologies, a company based in Heilbronn. The scientists aim to develop a membrane separating positive and negative electrodes so that different electrolyte fluids can be used on either side. The Oldenburg team is using several methods, including surface spectroscopy and electrochemical scanning microscopy (SECM), to investigate the processes on the surface of the membrane and electrodes.

Long-term impact of the Covid pandemic

The University Medicine Oldenburg is involved in the work of the COVID-19 Research Network Lower Saxony (COFONI) with two projects. Together with psychologist Prof. Dr Andrea Hildebrandt and sociologist Prof. Dr Gundula Zoch, medical informatics expert Prof. Dr Antje Wulff and psychologist Prof. Dr Mandy Roheger are developing models that can estimate how a person's individual health profile influences their risk of suffering long-term effects of COVID-19. Health services researcher Prof. Dr Falk Hoffmann is investigating the development and progression of mental illnesses in children and adolescents during the pandemic. The research projects at the University have been allocated some 670,000 euros in funding.

Digital presentation of cultural heritage

A new research network based in Oldenburg is investigating how digital technologies can be used to preserve humanity's cultural heritage – including historical objects and documents in museum collections and archives. The aim is to enable unbiased interpretation and improve access. The project "Digitisation, Visualisation and Analysis of Collection Items" (DiViAS) has received 2.7 million euros in funding from the state of Lower Saxony and the Volkswagen Foundation for an initial funding period of three years. DiViAS is a collaborative project between the University of Oldenburg's Institute of History, the Prize Papers Project headed by Prof. Dr Dagmar Freist (based at the institute and part of the German Academies Programme), the Institute for Applied Photogrammetry and Geoinformatics at the Jade University of Applied Sciences Wilhelmshaven, Oldenburg, Elsfleth and the State Museum Nature and Human Oldenburg. Other partners are University Hanover's Institute for Cartography and Geoinformatics and the Head Office of the Common Library Network Göttingen (VZG), as well as various associated researchers in Germany and abroad. The project combines novel scientific methods and practices to digitise, analyse and display colonial collections. The resulting procedures will be made widely available in a digital toolbox.

Controlling mosquito populations by targeting their sense of hearing

Together with researchers from University College London (UK), Oldenburg biologist Prof. Dr Jörg Albert has shown that the neurotransmitter octopamine plays a crucial role in temporarily enhancing the hearing of Anopheles mosquitoes. Because the male mosquitoes of this malaria-transmitting species need a good sense of hearing to

detect female mosquitoes and reproduce, this finding could result in a novel approach to controlling mosquito populations. The scientists were also able to demonstrate that the octopamine receptors in these insects can be artificially activated using pesticides such as amitraz. Stimulating the receptors outside normal mating times could con-

fuse male mosquitoes, making them unable to detect females in swarms of hundreds of mosquitoes flying together at dusk, when most mating occurs. According to the researchers, there may also be a molecule that can inhibit the octopamine receptors and thus prevent the enhanced hearing that is crucial for the mosquitoes to mate.

How migratory animals navigate

The German Research Foundation has approved further funding for the Collaborative Research Centre "Magnetoreception and Navigation in Vertebrates". Led by Oldenburg biologist Prof. Dr Henrik Mouritsen, the project will receive up to 9.2 million euros in its second phase, which ends in 2026. The central objective is to gain a comprehensive understanding of all aspects of the magnetic sense and navigation abilities in vertebrates – from signal

detection and neural processing to the animals' natural behaviour and migration routes. A main focus in the second funding period is the analysis of magnetically sensitive proteins, which the team is now able to produce in cell cultures. The researchers plan to conduct experiments and use computer simulations to gain insights into which parts of the proteins are important for magnetoreception. The research will also focus on the processing of magnetic stimuli

and other important information for navigation in the brains of migratory animals. In addition, a new sub-project led by Oldenburg biologist Dr Oliver Lindecke is investigating the migratory behaviour and magnetic orientation of pipistrelle bats, which can cover thousands of kilometres during migration. Another recently launched sub-project is focusing on how the decision to winter in a particular location affects the breeding success of migratory birds.

From gender history to fashion

Four projects at the University of Oldenburg are receiving funding from the regional funding programme Pro*Niedersachsen as of August 2023. A team led by medieval history expert Prof. Dr Almut Höfert is investigating the role of gender in medieval concepts of peoples and communities in the project "Gentes und Nationes". The project "Colportage Literature" focuses on nineteenth-cen-

tury prints from publications, books and religious tracts distributed at fairs in Oldenburg. A team led by Dr Christian Schmitt, a scholar in German studies, is analysing and digitising these small prints, which were very common at the time and provided readers with a wide range of information. In another project, the Institute of Material Culture is collaborating with the Museum Bückeburg

to research fashion trends in traditional costumes from the Schaumburg region in Lower Saxony, a subject that has received little academic attention to date. The University is also working together with the National Park House Wittbülten on the island of Spiekeroog to integrate more information about the research activities on the island into the centre's permanent exhibition.