ISSN 2599-8293

European Commission

CORDIS Results Pack on

Horizon in Poland

A thematic collection of innovative EU-funded research results

March 2025

Supporting cutting-edge research, from digital democracy to dark matter

Research and Innovation

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Editorial

Supporting cutting-edge research, from digital democracy to dark matter

For over 40 years, the European Union has supported cutting-edge science, research and innovation. By driving scientific progress, the EU's research and innovation programme helps to tackle some of the most important challenges facing Europe, from cancer to climate change.

This CORDIS Results Pack on Horizon in Poland is the first in a series highlighting the impact of EU funding in fostering scientific innovation, increased competitiveness, employment opportunities, and the growth and scale-up of innovative businesses.

Poland lays claim to a long and illustrious scientific legacy. From the revolutionary insights of astronomist Nicolaus Copernicus to the pioneering discoveries of Marie Skłodowska-Curie, Polish researchers have contributed to advancements in nuclear and particle physics, medicine, virology, nutrition, economics, linguistics, and far more.

Through its flagship funding programmes, most recently Horizon 2020 (2014-2020) and Horizon Europe (2021-2027), the EU has invested over EUR 2 billion across 10 000 research and industry organisations in Poland. Recipients include almost 100 acclaimed principal investigators awarded research excellence grants, and more than 280 early-career researchers accepted into the Marie Skłodowska-Curie Actions fellowship programme.

The eight projects in this Pack highlight the breadth of the research supported through Horizon in Poland. They include the commercialisation of biotechnology that can turn waste methane into high-grade ecological products, the advancement of techniques to recover valuable materials from used tyres, bolstering trust in the democratic process, strengthening defence against radiological attacks, earthquake modelling, novel biological fertilisers, investigations into the nature of dark matter, and more.

Together, these projects showcase the continuing importance of Poland's contributions to science, research and innovation, and the country's central role in tackling major challenges of our time.

From waste to worth – novel extraction of carbon black from used tyres

Carbon black, known more frequently as soot, is widely used in manufacturing. A new way of extracting and purifying carbon black from recycled tyres is being pioneered by the CBreCYCLE project, reducing emissions and saving natural resources.

© CBreCYCLE

If you are not involved in certain manufacturing sectors you may not have heard of carbon black. More familiarly known as soot, its use is ubiquitous. In tyre manufacturing it enhances durability and resistance to wear and tear. It's also used in plastics, inks and coatings for its colouring properties. The importance of carbon black lies in its versatility and fundamental role in these applications.

As things stand, the primary method of producing carbon black involves the burning of crude oil, which involves the consumption of natural resources and results in CO_2 emissions and other harmful greenhouse gases.

The CBreCYCLE project has developed a novel technique that bypasses the need for 'virgin' carbon black. "Our process recovers carbon black from recycled tyres, offering a cost-effective alternative for the production of this vital resource. We won't eradicate the need for carbon black – but we can make the way we extract it far more environmentally friendly!" asserts project

coordinator Martyna Sztaba, based at Syntoil, Poland, which hosted the project.

Globally, around 1 billion tyres are discarded annually, but only about half are recycled. The rest contribute to CO_2 emissions or environmental hazards in landfills. This situation highlights the inefficiency in tyre recycling and the urgent need for sustainable practices.

But the technology developed by the project, with the help of EU funding, doesn't only reduce the environmental impact of production.

"Another advantage of our product is its high quality, making it suitable for applications such as in the production of paints and pigments. This is a new avenue for recycled carbon black which, previously, has not been of a high enough standard to be used in those processes. Ours can be, opening up new possibilities for the application of recovered carbon black, which were previously limited by the lower quality of recycled product," says Sztaba.

Novel system of pyrolysis and carbonisate refinement

Our process recovers carbon black from recycled tyres, offering a cost-effective alternative for the production of this vital resource.

For every tonne of traditional virgin carbon black produced, about 1.5-2.5 tonnes of CO_2 are emitted, Sztaba explains. This is a significant factor, considering that the global demand for carbon black is around 15 million tonnes annually.

"In comparison, our recovered carbon black produces less than 0.5 tons of CO_2 per tonne, marking a substantial improvement in terms of emissions," she adds.

This is achieved for example through an innovative system of pyrolysis developed by Syntoil through the project, and a novel approach to purification.

Pyrolysis is a method of decomposing organic material at high temperatures in the absence of oxygen. In the context of tyre recycling, it involves heating used tyres to break them down into various components, one of which is contaminated carbonisate (contaminated soot) which is then purified and changed into recovered carbon black.

What sets Syntoil's process apart is the use of continuous pyrolysis, where heating is entirely electric, unlike traditional pyrolysis that often relies on gas burning. This makes the process very precise.

But the real innovation, and what gives the project's product the competitive edge, involves the purification of the pyrolysis solid residue, known as contaminated char or carbonisate.

This contaminated carbonisate undergoes a sophisticated thermochemical process in Syntoil's facility, where it is purified to the level of virgin carbon black made from crude oil.

"It's this ability to refine the carbonisate, to high purity standards, that truly distinguishes our product in the market."

Part of a wider shift to valuing waste streams

The CBreCYCLE project feels their work is going beyond recycling. Sztaba believes the team are redefining the life cycle of materials. "Our hope is that this technology becomes a cornerstone in a more circular economy, where waste reduction, resource efficiency and environmental sustainability are not just ideals but practical realities."

Syntoil aims to expand their reach by refining and scaling up the process to cater to a broader market. They hope this will not only increase the adoption of recovered carbon black, but also set a precedent for other sustainable industrial practices.

"We're proud to be part of a global shift where used materials are treated as valuable products, not waste," Sztaba says.

Note: this article was last updated on the 5th of June 2024.

PROJECT
CBreCYCLE – Recycling shredded used tyres and rubber waste into personalized recovered Carbon Black to limit use of fossil fuels and carbon dioxide emission

COORDINATED BY
Syntoil in Poland

FUNDED UNDER
Horizon 2020-SME, Horizon 2020-Societal Challenges and Horizon 2020-LEIT

CORDIS FACTSHEET
cordis.europa.eu/project/id/101009283

PROJECT WEBSITE
syntoil.pl

New technologies for detecting dark matter

Innovative technologies are enabling the next generation of dark matter detectors and advancing our understanding of the invisible universe.

Almost all the energy that is stored in our universe exists as dark matter. Yet despite its abundance, we know surprisingly little about it.

"Dark matter appears to interact mainly through the force of gravity and is likely composed of elementary particles that have yet to be identified," says Marcin Kuźniak, group leader at the Particle Astrophysics Science and Technology Centre, an autonomous unit of the Nicolaus Copernicus Astronomical Center (NCAC) of the Polish Academy of Sciences.

However, this is just a hypothesis. What dark matter is and how it is generated remains one of the great unsolved problems of physics.

But the curtain that has shrouded this mystery is starting to be pulled back, thanks in part to initiatives such as the EU and industry-funded DarkWave project.

DarkWave is developing new technologies that will enable the next generation of dark matter detectors used to observe the

universe. "With the right technologies, these very large detectors, which are typically located in underground laboratories, could allow us to directly detect dark matter," adds Kuźniak, who coordinated the project.

New technologies make detectors more sensitive

During the project, researchers from NCAC, together with four partner institutions in France, Germany and Italy, developed a comprehensive portfolio of dark matter-detecting technologies. These include new wavelength shifter (WLS) materials and photosensors, along with new seismic and infrasound sensors that can be used to monitor the background noise levels around the detector.

Researchers also created algorithms for signal processing and analysis that can be used to extract information from the data collected by the detectors. Furthermore, the project enabled scientists to purchase the materials they needed to conduct experiments, research and tests.

"All these technologies and support help make detectors more sensitive than ever before," notes Kuźniak.

Taking dark matter detectors to the next level

With the right technologies, these very large detectors, which are typically located in underground laboratories, could allow us to directly detect dark matter.

These technologies have already had a direct impact on the quest to understand the nature of dark matter. For example, the under-construction DarkSide-20k detector is benefiting from novel fluorescent and reflective materials that were developed by the project. These materials will significantly improve the detector's light collection sensitivity while dramatically simplifying its construction.

The project also helped establish two cryogenic test stands in Warsaw where these types of materials, along with ultra-modern arrays of photosensors, are now tested in representative conditions prior to being installed in the detector.

In addition, DarkWave also brought the dark matter and gravitational wave communities together. For instance, new networks of seismic and infrasound sensors for monitoring backgrounds at the Virgo gravitational wave observatory were developed and tested during the project. They were also used to map the seismic and infrasound environment at the DarkSide-20k underground experiment site.

Helping young scientists get hands-on experience

Beyond the technology, the project focused on supporting scientists and early-stage researchers, and on advancing the project host's capabilities through collaboration with advanced partner institutions. With the project's support, these researchers were able to take part in several measurement campaigns at CERN and Virgo, amongst others.

"The mobility granted by DarkWave became a catalyst for knowledge accumulation and experience gathering, making it one of the project's most substantial and important outcomes," remarks Yuliya Hoika, EU project coordination specialist at NCAC.

These researchers, along with the entire project team, are now poised to continue to advance the knowledge, networking and innovative ideas fostered by DarkWave. This includes exploring the potential to commercialise some of the solutions developed during the project, as well as launching STELLAR with the support of the Marie Skłodowska-Curie Actions programme, and the EU-funded project Astrocent Plus, both Horizon Europe projects.

PROJECT
DarkWave – Novel technologies for dark matter search and frontier astroparticle physics experiments

COORDINATED BY
Nicolaus Copernicus Astronomical Center in Poland

FUNDED UNDER
Horizon 2020-Spreading excellence; widening participation

CORDIS FACTSHEET
cordis.europa.eu/project/id/952480

PROJECT WEBSITE
n/a

Anxieties over internet voting reflect wider social concerns

The EU-funded ELECTRUST project found that trust issues are key to voters' attitudes around online ballots, and could help inform standards for the successful implementation of digital democracy.

The internet has transformed many aspects of our daily lives, from how we watch television to how we find romantic partners. However, it has yet to radically transform how people access and interact with government services.

Despite being technologically feasible for a couple of decades, i-voting – where voters submit their ballot via the internet, in an unsupervised environment – has not been embraced by many governments.

"Trust issues lie at the heart of many of the explanations for this reluctance," explains David Duenas-Cid, principal investigator of ELECTRUST. Hosted at Gdańsk University of Technology, the project was undertaken with the support of the Marie Skłodowska-Curie Actions programme.

ELECTRUST explores how discourse around i-voting both constructs and leverages issues of trust and distrust, ultimately framing public opinion of the technology and its promoters.

Beyond technology

Estonia is the only country where i-voting is used in all elections. Some countries, such as Canada, have implemented it in local elections, while France and Panama have deployed it for expatriated voters.

ELECTRUST conducted an extensive case study of New South Wales, Australia, where i-voting was abandoned after early experiments. Cryptography experts had raised security concerns about the integrity of the system, while an unexpectedly high number of voters had experienced technical problems with the identification process.

"This is symptomatic of one of the key problems with i-voting: a clash between trust and distrust. The decision makers discontinued it out of fear," adds Duenas-Cid.

Duenas-Cid interviewed various stakeholders including technology providers, electoral administrators, journalists, politicians and activists.

Preliminary analysis highlights how i-voting discourse flexibly adopts trust- and distrust-related arguments, often unconnected to the technology, but rather touching on wider sociopolitical contexts and individual beliefs.

A guide for future elections

Exploratory case studies have also been undertaken into the various forms of i-voting adopted by Estonia, the Netherlands, Norway and Switzerland.

One side study that compared Estonia and the Spanish province of Catalonia outlined how i-voting is top-down in Estonia, as a branch of the country's e-governance system seeking easier democratic participation. By contrast, in Catalonia, the online participation system 'Decidim' evolved as a bottom-up development to encourage wider citizen engagement.

"Our approach was informed by theories of ideal democratic methods – how decisions are made, and by whom," says Duenas-Cid. "We've found that i-voting offers a more direct democracy, which can reach the marginalised and transform public administration through wide-ranging citizen engagement."

Interesting paradoxes were also found between communities seemingly at odds, despite the common goal of improved democratic systems. For example, while some experts cite cybersecurity concerns, voters with disabilities argue that i-voting enables equal participation in elections.

We've found that i-voting offers a more direct democracy, which can reach the marginalised.

The project's findings will be outlined in a white book, including recommendations for policymakers. Duenas-Cid says ELECTRUST offers a valuable contribution to debates about the expansion of i-voting: "We're not necessarily arguing for widespread i-voting implementation, but our results could help explain some of the likely reactions to its adoption."

Note: this article was last updated on the 3rd of July 2024.

PROJECT
ELECTRUST – Dynamics of Trust and Distrust Creation in Internet Voting

COORDINATED BY
Gdańsk University of Technology in Poland

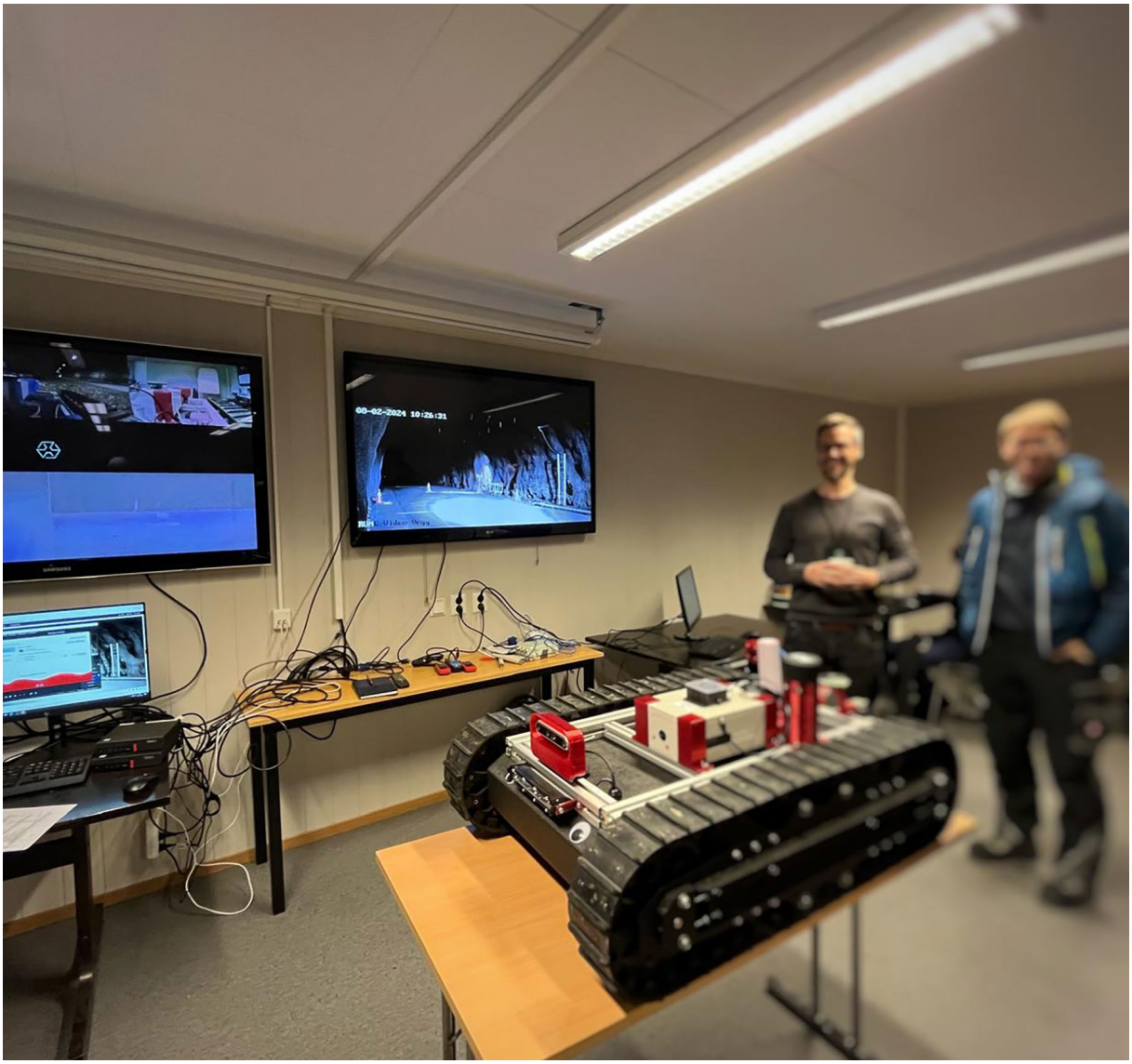
FUNDED UNDER
Horizon 2020-Spreading excellence; widening participation

CORDIS FACTSHEET
cordis.europa.eu/project/id/101038055

PROJECT WEBSITE
n/a

Reinforcing Europe's radiological barrier

What are the tools the EU needs to be prepared for the next wave of radiological threats?



© EU-RADION

Some argue that the best defence is to be prepared for any potential threats. Researching and preparing Europe's defence against chemical, biological, radiological, nuclear and explosive (CBRNE) threats is more crucial than ever. The EU-funded EU-RADION project has gone the extra mile to make this a reality.

A general CBRNE protection strategy exists with the ENCIRCLE Catalogue, but EU-RADION focused on developing an advanced radiological threat detection and identification system.

Resilience is the message

According to its coordinators, EU-RADION enhances the region's resilience against CBRNE threats by delivering tools specifically designed to meet the needs of end users, primarily first responders and emergency management agencies.

This includes a wide range of capabilities from advanced sensor platforms to sensor units capable of being used in stationary set-ups, mounted on unmanned vehicles or worn by personnel. It also includes providing real-time data and predictive models through integrated situational awareness tools.

The EU-RADION project successfully achieved its primary objectives, leading to significant advancements in radiological threat detection and identification capabilities.

With the project successfully completed in February 2024, there were key accomplishments to highlight. "The EU-RADION project successfully achieved its primary objectives, leading to significant advancements in radiological threat detection and identification capabilities within the EU," project coordinator Łukasz Szklarski notes.

Among these achievements were the creation of handheld, stationary and unmanned sensor platforms equipped with the Sensor Integration Unit (SIU) for real-time detection and monitoring of radiological threats, as well as successful operational testing of the system in realistic scenarios, demonstrating its effectiveness and robustness in various environmental conditions. Also, the creation of an advanced data fusion model – which significantly enhances the capability to identify radionuclides – is a critical component in improving radiological hazard detection and response.

A sensor's data riddle

Looking at the achievements of the project, it's easy to think that everything went according to plan and without hurdles. But the reality is that such a system of radiological defence faced several challenges, "particularly in the integration and development of advanced sensor systems and data processing tools," explains Szklarski.

It also required effective collaboration and knowledge exchange between international partners, which involved regular meetings, workshops and extensive documentation to align on technical specifications and development goals. Other complex issues were coordinating the use of the Runehamar Test Tunnel in Norway for the final demonstration, which required meticulous planning and collaboration among all project partners.

"Following the completion of the EU-RADION project, our next steps are guided by the philosophy and directives of the European Commission," Szklarski notes. "We aim to continue advancing and refining the technology developed during the EU-RADION project."

This includes refining and commercialising the developed sensor platforms and software tools to meet market demands and user needs, as well as ongoing collaboration with industry partners, stakeholders and end-users to enhance the system's capabilities. And, finally, seeking additional funding to support the expansion of the project's scope. Szklarski also mentions the CHIMERA project, which aims to elevate the technology to TRL 8, integrating the detection of biological and chemical signals into the real-time network developed by EU-RADION.

As the project transitions to further technological development and commercialisation, its contributions to European resilience against CBRNE threats will continue to grow, with the overall goal of ensuring a safer and more secure future for all.

Note: this article was last updated on the 16th of August 2024.

PROJECT
EU-RADION – European System for Improved Radiological Hazard Detection and Identification

COORDINATED BY
ITTI in Poland

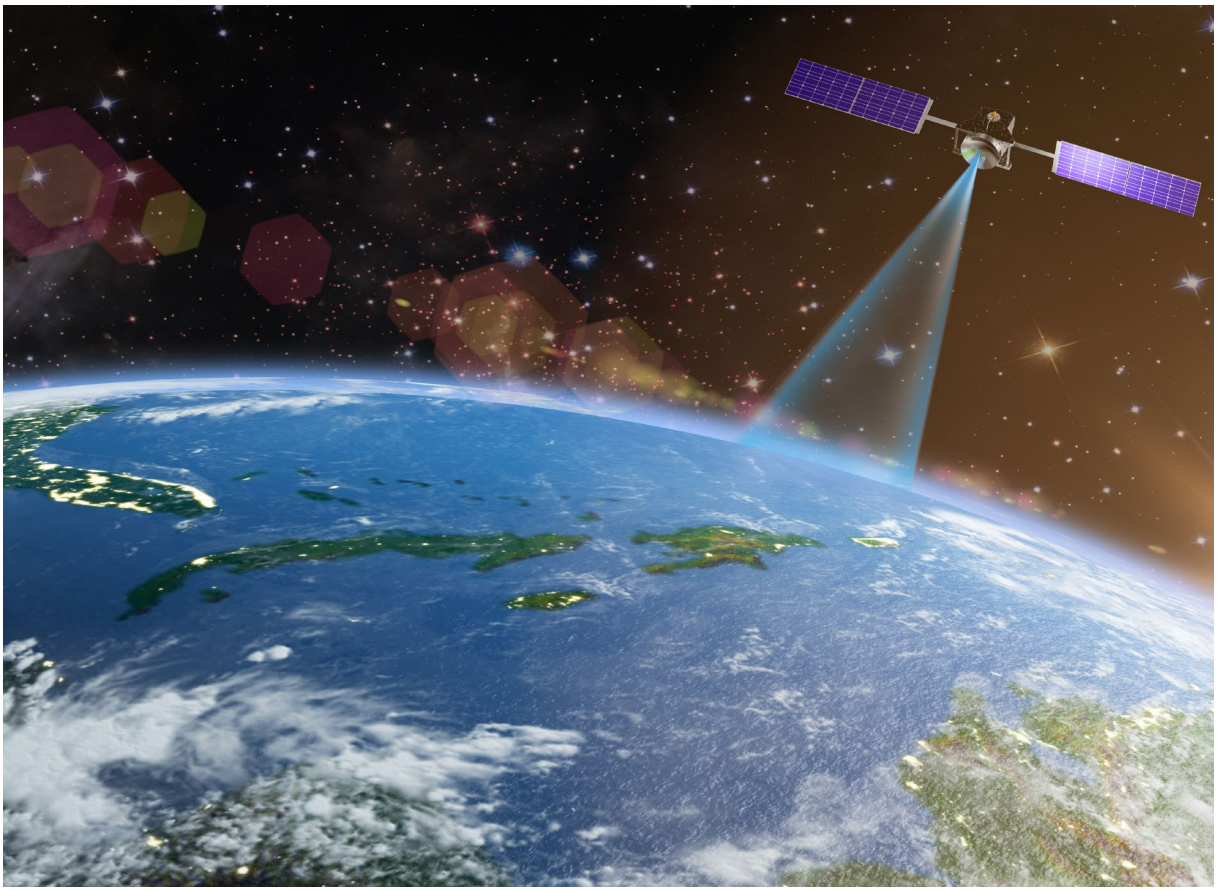
FUNDED UNDER
Horizon 2020-SECURITY

CORDIS FACTSHEET
cordis.europa.eu/project/id/883204

PROJECT WEBSITE
eu-radion.eu

Training the next generation of geospatial scientists

Through twinning, knowledge sharing and networking, universities from across Europe join forces to enhance everyone's geospatial know-how.



While the mining sector's focus may be on the natural resources found under the Earth's surface, its work is heavily dependent on information derived well above ground – from space.

In fact, mining companies have long used such geospatial technologies as Global Navigation Satellite Systems (GNSSs) and Earth Observation for everything from surveying sites to accessing remote areas, managing activities and even operating machinery. This same technology can also be used by researchers and regulators to study and help mitigate the effect mining activities have on the environment.

But as the geospatial field continues to evolve, with new technologies opening the door to new opportunities, there is a growing demand for new talent.

Helping to meet that demand is the EU-funded GATHERS project.

Increasing geospatial capacity and expertise

The project aims to increase the capacity of the Wrocław University of Environmental and Life Sciences (UPWr) to train the next generation of geospatial specialists. "UPWr, through its Institute of Geodesy and Geoinformatics, has established itself as a leading player in the field," says Maya Ilieva, a UPWr researcher and GATHERS project coordinator.

The GATHERS project has created a network of well-trained scientists ready to position Europe as a global leader in the use of geospatial technologies within the natural resources sector.

According to Ilieva, the institute has developed a range of groundbreaking GNSS-based algorithms, software and applications for precise point positioning, orbit determination and meteorology – amongst others.

"The problem is that our work, along with similar work being done across Europe, tends to be done in a silo," she adds. "Imagine what we could accomplish if we coordinated our work and shared our expertise?"

Instead of imagining, GATHERS decided to find out.

A pan-European scientific and educational network

With the support of the European Commission's Widening Participation and Spreading Excellence (twinning actions), the project created a scientific and educational network between UPWr and some of Europe's leading universities in other geoscience fields.

Specifically, the network included: the Technical University of Delft, a world leader in the use of interferometric synthetic aperture radar for registering areal surface deformations; the Technical University of Vienna, which is renowned for the development of innovative light detection and ranging (lidar) techniques; and Sapienza University of Rome, a pioneer in the use of the variometric approach in GNSS seismology.

"Together, we set out to build a sustainable method for integrating these different techniques and then training early-stage researchers in using them," explains Ilieva.

Positioning Europe as a geospatial leader

The outcome has been impressive, with the project conducting 25 training sessions for UPWr staff, including nine experienced researchers, nine early-stage researchers, and seven Master of Science students. Thanks in part to these activities, one of the participants has gone on to become a professor, whilst others are in various stages of their PhD and postdoc work.

Furthermore, strong research groups were established between the various project partners – with plans for continuing this collaboration into the future. These groups are already coordinating several joint research projects and have co-authored over 10 scientific papers.

"The GATHERS project has enhanced the knowledge and capabilities of UPWr, positioning it as a leader not only in GNSS, but in the geosciences," concludes Ilieva. "But most importantly, it has created a network of well-trained scientists ready to position Europe as a global leader in the use of geospatial technologies within the natural resources sector."

Note: this article was last updated on the 18th of October 2024.

PROJECT
GATHERS – Integration of Geodetic and imAging TecHniques for monitoring and modelling the Earth's surface defoRmations and Seismic risk

COORDINATED BY
Wrocław University of Environmental and Life Sciences in Poland

FUNDED UNDER
Horizon 2020-Spreading excellence; widening participation

CORDIS FACTSHEET
cordis.europa.eu/project/id/857612

PROJECT WEBSITE
gathers.eu

Bioprocess turns methane into eco-friendly material

A cutting-edge bioprocess that uses bacteria to turn methane into a biodegradable raw material could help to tackle both greenhouse gas emissions and packaging waste.

© Joaquin Corbalan/stock.adobe.com

Packaging materials made of petrochemical-based polymers are difficult to remove from the environment. "Depending on the type of polymer, decomposition can take tens, hundreds and even thousands of years," notes Methanotrophy project member Pawel Stepniewski from Microbic in Poland.

In response, industry has been examining the potential of using biopolymers of natural origin. Unlike synthetic ones, these can be easily broken down by microorganisms in soil and decompose into compounds such as carbon dioxide and water.

An interesting example of this is poly-3-hydroxybutyrate (PHB), a biopolymer which has already found wide application in industry, medicine and pharmaceuticals.

Turning methane into high-grade ecological products

The EU and industry-funded Methanotrophy project sought to commercialise an innovative technique that could help to turn waste methane into high-grade, ecological products, including PHB. On a 100-year timescale, methane has 28 times greater global warming potential than carbon dioxide and is 84 times more potent on a 20-year timescale.

At the core of this biotechnology are methanotrophs – bacteria that use methane as their main source of carbon and energy. "An important feature that distinguishes methanotrophs from other bacteria is their ability to oxidise methane to methanol as an intermediate product," explains Stepniewski.

"A number of studies have focused on these bacteria due to their potential in extracting methane. Our research on methanotrophic bacteria, conducted over several years, has led to new findings regarding methanotrophic bacteria activity."

Specifically, the Methanotrophy project wanted to see if certain cultures of methanotrophic bacteria could be used as biofilters capable of absorbing methane and producing PHB at an industrial scale. This could help to reduce methane emissions, and produce a valuable, biodegradable raw material.

"This project aimed to support the long-term research of Microbic co-founder Zofia Stepniewska, and to validate the technology and business model we're working on," says Stepniewski. "It also helped us to build a bioreactor for methanotrophic bacteria to produce, for example, PHB."

Successfully cultivating methanotrophic bacteria

Purchasing a bioreactor enabled the project team to cultivate methanotrophic bacteria and to control production conditions. Testing the cultivation of methanotrophic bacteria in a bioreactor has significantly advanced knowledge of how to produce PHB efficiently, as well as which types of methanotrophic bacteria to collect.

"We found that the methanotrophic bacteria multiply well under given conditions, and are effective in absorbing methane," adds Stepniewski. "This work was achieved thanks to the funds obtained, and the quality of research that we were able to conduct."

The team also analysed potential customer needs when it comes to PHB, available production technologies and market size. Business plans were produced for further developing the spin-off company and to take steps towards commercialisation. The project was funded through the Women TechEU programme, which supports early-stage deep-tech start-ups led by women.

Potential applications in medicine and technology

Next steps will include optimising the extraction and granulation of PHB. These stages will be critical for bringing the technique to market.

"We have shown that methanotrophic bacteria can be used to manage waste methane," notes Stepniewski.

"Ensuring profitability of this method, though, will require several more stages of research. We need to take into account the environmental value of bioplastics such as PHB as well as their biodegradability and examine in more depth potential applications in medicine and technology."

We have shown that methanotrophic bacteria can be used to manage waste methane.

PROJECT
Methanotrophy – METHANE MANAGEMENT USING METHANOTROPHIC BACTERIA

COORDINATED BY
Microbic in Poland

FUNDED UNDER
Horizon Europe-European innovation ecosystems

CORDIS FACTSHEET
cordis.europa.eu/project/id/101072176

PROJECT WEBSITE
microbic.pl

Identifying microbes that can boost plant growth in saline soils

Beneficial bacteria hold great potential for reducing fertiliser use, but strains must be suited to the soil they are used in. Identifying such strains can help European agriculture towards a more sustainable future.

© Taras Rudenko/stock.adobe.com

Plant growth-promoting rhizobacteria (PGPR) are beneficial microorganisms that live in soil adjacent to the roots of plants, as well as on root surfaces and inside root tissues. There is increasing recognition that these organisms can help provide plants with the necessary elements they need for growth, in a similar way to mineral fertilisers.

"For example, PGPR can fix nitrogen from the air and decompose proteins," explains NitroFixSal project coordinator Agnieszka Kalwasińska from Nicolaus Copernicus University in Poland. "This supplies the soil with ammonium."

PGPR also produce phytohormones that stimulate plant development, and enzymes that are able to decompose fungal

cell walls, protecting plants against pathogens. in Poland. "This supplies the soil with ammonium."

Reducing mineral fertiliser and pesticide use

There is significant opportunity to reduce the use of mineral fertilisers and pesticides by exploiting the potential of these naturally occurring bacteria. To be successful at a commercial scale however, scientists need to be able to identify and isolate bacteria species with sufficient survival rates, and use amounts that suit both the soil type and the plant species.

This could be important for both economic and environmental reasons. Prices for chemical fertilisers – including ammonium nitrate, phosphorus and potassium – have increased sharply due to the rising cost of natural gas. Meanwhile, the EU is obliged to reduce the use of these fertilisers in order to meet its green objectives.

"In the NitroFixSal project, we took bacteria with PGPR properties from extreme saline environments," says Sweta Binod Kumar, a biotechnologist who also worked on the project. "This is because microorganisms naturally adapted to high-salinity conditions can better promote plant growth under salt stress, and contribute to increased plant biomass and protection against pathogens."

These isolated PGPRs are now potential candidates for biofertilisers, which could benefit farmers facing yield loss of their crops due to high-salinity conditions of the soil.

The PGPR strains that the project team extracted underwent extensive investigations in order to characterise their PGPR properties. The strains were applied as biostimulants, to improve the germination of wheat in laboratory conditions.

"The next step involved a field study, in which selected strains were applied to non-sterile soil," adds Kalwasińska. "Finally, the interactions between bacteria and wheat plants were investigated using advanced molecular methods. This enabled us to better understand the mechanisms of their action."

Identifying potential biofertiliser candidates

The NitroFixSal project successfully demonstrated that saline environments are a valuable source of nitrogen-fixing bacteria with various plant growth-promoting potential. Several new strains were characterised.

Two bacterial strains were shown to significantly mitigate salt stress in cereals. One of these has since been submitted to the Polish Collection of Microorganisms. Two patents of the isolate, together with its growth promotion effects on wheat, are ready to be submitted to the Polish Patent Office.

"These isolated PGPRs are now potential candidates for biofertilisers," notes Kalwasińska. "These could eventually benefit in particular farmers facing yield loss of their crops due to high-salinity conditions of the soil."

Data generated from the project will also help researchers to better understand plant-PGPR interactions at the molecular level. Researchers hope to unravel lesser-known plant growth activity, which could lead to the development of new biostimulator formulations and tools for designing new breeding strategies.

"Our project very much aims to contribute towards sustainable agriculture," says Kalwasińska.

Note: this article was last updated on the 5th of April 2023.

PROJECT
NitroFixSal – N fixing bacteria from extreme environments as a remedy for nitrogen deficiency in saline soils

COORDINATED BY
Nicolaus Copernicus University in Poland

FUNDED UNDER
Horizon 2020-Spreading excellence; widening participation

CORDIS FACTSHEET
cordis.europa.eu/project/id/101038072

PROJECT WEBSITE
n/a

Placing ethics at the centre of digital healthcare

Taking account of ethical issues – and the concerns of elderly patients – will help to ensure that digital healthcare technologies address the needs of all citizens.

Digital technologies are increasingly applied to healthcare, improving the way that patients are diagnosed and how services are delivered. These technologies include smartphone apps, wearable devices and platforms that provide remote healthcare. Artificial intelligence (AI) software can also be used to track symptoms and analyse data from medical devices.

"Technology can help people to manage health issues, and can be used to distribute healthcare information," notes REINITIALISE project coordinator Ilona Biernacka-Ligięza from Maria Curie-Skłodowska University in Poland.

"We saw this during the COVID-19 epidemic. However, elderly people, who are often the most in need of care, can struggle to use new devices, and find it difficult to access digital health services."

Combining technological and ethical issues

The EU-funded REINITIALISE project sought to address these issues by bringing together researchers from Belgium, Italy and Poland. The project team contained experts in ICT and engineering, as well as researchers focused on ethic issues in fields including AI and healthcare.

A key element of the project involved establishing Maria Curie-Skłodowska University as a leading expert in digital technologies and fundamental rights, achieved through staff exchanges with KU Leuven in Belgium and the University of Macerata in Italy.

"We began the project by looking at the quality of existing healthcare devices and their usefulness for seniors," says Biernacka-Ligięza. "The project started during the pandemic, so much of this work was theoretical."

As people began to travel again, staff exchanges between the partner institutions were organised. Academic symposiums, job shadowing and cross-disciplinary mentoring were carried out.

Involvement of senior citizens

Another important element of the project was the involvement of senior patients. "This was important, as the project was not just about fundamental research," adds Biernacka-Ligięza. "It was also about addressing the needs of senior citizens."

Questionnaires and workshops were organised, where valuable feedback could be gathered. Key concerns expressed by elderly patients using digital healthcare devices included ease of use, as well as data security and safety.

"These are some of the ethical and technological factors that designers will need to take into consideration moving forward," notes Biernacka-Ligięza.

Fundamental rights in digital technology design

The project has since published a Joint Research Roadmap on how to preserve fundamental rights in the design and use of digital technologies for e-health services. This integrated plan aims to link research and design excellence with the specific needs of end users.

"The Roadmap also describes our future plans for cooperation, and identifies AI in healthcare as a key field of research," explains Biernacka-Ligięza. "This research will look not only at the design of AI devices, but also at the impact, risks and dangers of applying AI within the healthcare system."

The project team also developed a Knowledge Platform, which aims to ensure that the collaborative learning process pioneered through this project is continued.

The platform contains a mentorship and networking section, allowing researchers and staff involved in the project to continue working together. There is also a training section, which includes virtual training content and material collected from project training events.

"This project will have a positive impact for elderly patients," says Biernacka-Ligięza. "End user feedback is crucial to designing healthcare tools for the future, as well as for planning policy."

End user feedback is crucial to designing healthcare tools for the future.

Note: this article was last updated on the 9th of May 2024.

PROJECT
REINITIALISE – pREserving fuNdamental rIghTs In the use of digitAl technoLogies for e-health ServicEs

COORDINATED BY
Maria Curie-Skłodowska University in Poland

FUNDED UNDER
Horizon 2020-Spreading excellence; widening participation

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Published
on behalf of the European Commission by CORDIS at the
Publications Office of the European Union
L-2985 Luxembourg
LUXEMBOURG

cordis@publications.europa.eu

This Results Pack is a collaboration between CORDIS and the Directorate-General for Research and Innovation.

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Print	ISBN 978-92-78-44775-5	ISSN 2599-8285	doi:10.2830/5866252	OA-01-25-030-EN-C
HTML	ISBN 978-92-78-44769-4	ISSN 2599-7890	doi:10.2830/3196292	OA-01-25-029-EN-Q
PDF	ISBN 978-92-78-44774-8	ISSN 2599-8293	doi:10.2830/5455057	OA-01-25-030-EN-N

Luxembourg: Publications Office of the European Union, 2025

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