BNN

02/2020

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Editorial – *Contemporary issues from the network*

Dear Ladies and Gentlemen,

we hope you and your beloved ones are safe and healthy and not harmed by COVID-19. Of course we and our members supported the fight against the pandemic as much as possible, with different activities, e.g. in projects and device-development (see success story of BNN-member GENSPEED GmbH), promoting virtual goods-and-services-exchange platforms, etc. Above this, the entire BNN-team worked from home to support our partners on a continuous high-quality level. Furthermore, we have the pleasure to welcome Barbara, Petra and Clemens, our three new colleagues who have been hired to strengthen our services in the fields of quality management, sustainability, environmental safety and graphic design.

During these months besides the COVID-19-call, there was also the preparation and fine-tuning of the European Green Deal (EGD) Call and its consultation rounds on national and international level, making us busy and interacting with our members. It is expected that in September the EGD Call will be opened. Thus, we encourage you to already start generating ideas and to get in contact with the BNN team to initiate proposals for the EGD. Furthermore, on European level, the co-development process for FP9, the so-called Horizon-Europe, is ongoing. It will have a big virtual event, the R&I-days, which we like to bring to your attention (and of course BNN will actively contribute to this). The new framework program will also be part of our Annual forum, which will be held along with the NanoSyn-project activities including a nanoNET-AT-Workshop as back-to-back event. Thus, the synergies for the Austrian nano-community as well as the benefits for our international network partners will become visible along those two days.

Finally, we draw your attention to the 4th EU-Asia Dialogue on NanoSafety on October 7th, which will be structured to step forward “from discussion to implementation” and shall support the Malta Initiative. Especially the COVID-19-Situation has shown, that global collaboration is of utmost importance. Thus, BNN will further support to gain value added by global collaboration with the ambition of “**science without borders**”.

If you are interested in benefiting from BNN’s support and joining our scientific and innovative community and/or to get involved in the strategic work, please, contact us.

Sincerely,
BNN-Team

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BNN *News*

New BioNanoNet employees

We cordially welcome our new team members!

Barbara HAUPT

Hello!

My name is Barbara Haupt and I am the new graphic designer at BNN.

Until 2017 I studied at FH Joanneum in Graz and finished with a Master of Arts in Interaction Design. While working at an advertising agency I gained valuable experience in the fields of branding, Web design and art direction.

I like to accompany a project from conception to pixel-perfect implementation. At BNN I am responsible for everything that needs an attractive visual appearance. I am looking forward to working on your ideas together.

Best wishes,
Barbara

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Petra KOHLBACHER

Dear all,

My name is Petra Kohlbacher and I am responsible for the quality management at BNN.

I studied at the college of chemical engineering and at the university in Graz and finished with a Master of Arts in Health Promotion and Health Education.

I have several years of professional experience gained from renowned companies in the diagnostics industry (AVL, Roche Diagnostics, Payer Medical) within the framework of EN ISO 13485 and EN ISO 14001/9001 in the design, administration of corresponding documents, in employee training and in the area of Safety & Health (OHSAS 18001). I have also special experience in the areas of hygiene management, material management and in the characterisation of optical sensors.

I am looking forward to strengthening the BNN team in setting up quality management processes and working with innovative scientists, researchers, technicians and companies to develop a quality management concept in a European project and to be a contact person for you in quality affairs. Furthermore, I support the BNN team in health promotion and health education.

Nice regards,
Petra

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Clemens WOLF

Dear BioNanoNet Members,

as a new part of the BNN Team I am happy to introduce myself to the community. I studied Environmental System Sciences at the University of Graz, focusing on regional development and sustainability and wrote my master thesis at the Institute of Process and Particle Engineering of the Graz University of Technology. After finishing my studies, I started to work in product management for a sustainable shoe brand within a bigger company. As product manager I developed environmental and social friendly textiles and leathers with partners and was responsible from shoe design to market. The resulting materials found their way also in the main collection and were thus able to change a part of the industry for good. In the last year my focus was on the social impact of the company as well as the chemical regulations in the role as CSR Manager (corporate social responsibility).

In May 2020 I joined BNN's team, to give Scientific support for Environmental safety issues and sustainability. I look forward to getting to know you better and to build a close relationship with you, so that we can work together towards a more sustainable and safer future.

All the best,
Clemens

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BNN *member presentation*

ams – shaping the world with sensor solutions

ams designs and manufactures high-performance sensor solutions for applications requiring the highest level of miniaturization, integration, accuracy, sensitivity and lower power. Sensors represent our human senses. Intelligent sensors from ams make our life easier, more convenient and safer and thus enable a better lifestyle.

At ams “Sensing is Life” and our passion is in creating sensor solutions that make devices smarter, safer, convenient and more environment-friendly. Our sensor solutions are at the heart of the products and technologies that define our world today – from smartphones and mobile devices to smart homes and buildings, industrial automation, medical technology, and connected vehicles. Leading manufacturers around the globe rely on ams’ sensing know-how for advanced systems design.

Our comprehensive solutions take sensing to the next level by providing a seamless interface between humans and technology. Products include sensor solutions, sensor ICs, interfaces and related software for mobile, consumer, communications, industrial, medical, and automotive markets.

ams' technological leadership in the development and production of high-quality sensor solutions is based on almost 40 years of intensive research and development. We invest significantly in research and development, for example in 2019 our research and development expenses were EUR 261.2 million (14% of sales). Research and development activities have enabled us to grow in recent years and is at the heart of our extensive product and design pipeline. We have a 1,000+-member engineering core that ideates and designs its sensor solutions in 18 sensor fabrication, design facilities and application centers across the globe, serving more than 8,000 customers. ams focuses its internal fabrication on differentiated manufacturing while developing external partnerships for scalability and flexibility. Our research and development focus includes optical, imaging and audio sensor technologies for the end markets consumer, automotive, industry and medical technology. In addition, the development of appropriate software and algorithms is an integral part of ams' R&D activities. These strategies combined have resulted in ams successfully establishing itself as a provider of sensor solutions, in contrast to a single component supplier.

The research results achieved are backed up by a large number of international patent applications. ams has over 3,000 patents (granted and pending) worldwide, with approximately 150 registrations and grants being added each year. The scientific competence of ams in research is demonstrated by the numerous publications in international journals and contributions to conferences and conferences worldwide.

Recent product developments based on ams' R&D activities include solutions for rear OLED light sensors (BOLED), illumination solutions for 3D sensor applications for structured light (SL), time-of-flight (ToF) technologies, and Active Stereo Vision (ASV), high-performance VCSEL emitter for ADAS (Advanced Driver Assistance Systems) in the automotive sector, active noise suppression for loose-fitting, real wireless earphones as well as NIR image sensors with high quantum efficiency (QE) for 3D sensors.

ams' technology development focus areas include differentiated optical designs and micro-optics, high-performance VCSEL emitters, optical coatings that enable high-quality filter and light selectivity capabilities, NIR and hyperspectral image sensors as well as 3D sensor system solutions. With headquarters in Austria, ams employs around 8,500 people globally and is listed on the SIX Swiss Exchange (ticker symbol: AMS). More information about ams can be found at https://ams.com

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Recent scientific publications of BioNanoNet association members

In this newsletter issue only new publications of our members are listed.

Certainly, you can always view all members' publications sent to us from 2018 up to now by downloading the document BioNanoNet member publications or visiting our BNN website (subitem "Publications of BioNanoNet members").

Period March – May 2020

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Alejandro Alcaine, Beatriz Jauregui, David Soto-Iglesias, Juan Acosta, Diego Penela, Juan Fernandez-Armenta, Markus Linhart, David Andreu, Lluıs Mont, Pablo Laguna, Oscar Camara, Juan Pablo Martiınez and Antonio Berruezo, *Automatic Detection of Slow Conducting Channels during Substrate Ablation of Scar-Related Ventricular Arrhythmias*. Journal of Interventional Cardiology. Volume 2020. https://doi.org/10.1155/2020/4386841

Luxembourg Institute of Science and Technology (LIST)

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Project presentations

NanoFabNet H2020 EU project

- **Project duration**: 01 03 2020 - 28 02 2022 (24 months)
- **Total cost**: EUR 2 258 943,75
- **EU contribution**: EUR 2 220 725
- **Number of partners**: 14 beneficiaries
- **Coordinator:** ACUMENIST (Brussels, Belgium)

The NanoFabNet Project will create a strong international hub for sustainable nanofabrication, whose structure, business model and detailed strategies and action plans are designed, agreed and carried by its international stakeholders during the Project duration, in order to yield an (economically) self-sustaining collaboration platform: the NanoFabNet hub. The registered NanoFabNet membership organisation will provide an accountable, permanent secretariat to the hub; it will be responsible for the implementation of a long-term business plan, and the provision of validation services, trainings and consultations, while collaborative and cooperative activities between actors of the wider international nanofabrication community will be fostered within the open architecture of the hub, and may be supported by membership organisation, where necessary.

The hub will stand for (a) a well-implemented, guided approach to high levels of safety and sustainability, (b) trusted technical reliability and quality, and (c) compliance with and drive of harmonisation, standardisation, and regulation requirements, amongst all of its members and along their nanofabrication value chains. It is envisaged to have a complex, open structure, whose elements will be developed, agreed and validated in a step-wise approach to meet the high-level objectives outlined below. The achievability of these aims to be a one-stop-shop for all matters and concerns pertaining to sustainable nanofabrication and its successful incorporation into the complex, large-scale high-value industries by bringing together governmental and academic laboratories with large industries and SMEs, and thereby offering a coordination space for past, current and future collaborative nanofabrication projects (incl. both EU-funded projects and initiatives, as well as public-to-public partnerships (P2Ps) and public-private-partnerships (PPPs)).

Role of BNN:

BNN is responsible for the development and optimisation planning of the NanoFabNet hub and its membership organisation.

For more details visit the project website https://nanofabnet.eu.

Get connected with NanoFabNet on:

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NanoFabNet project has received funding from the European Union's HORIZON 2020 research and innovation programme under grant agreement n° 886171

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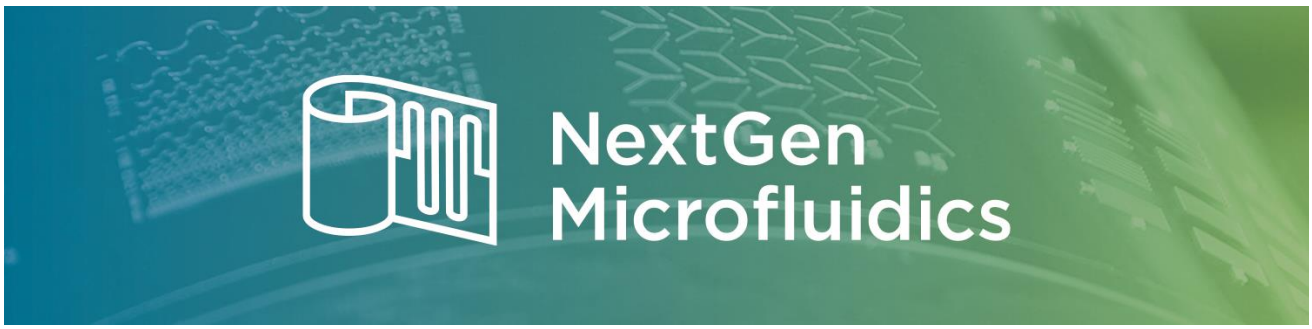
NextGenMicrofluidics H2020 EU project



Next generation test bed for upscaling of microfluidic devices based on nano-enabled surfaces and membranes

- **Project duration**: 01.04.2020 – 31.03.2024 (48 months)
- **Total cost**: EUR 17 198 218,75
- **EU contribution**: EUR 14 692 025,51
- **Number of partners**: 21 beneficiaries
- **Coordinator**: JOANNEUM RESEARACH Forschungsgesellschaft mbH (Austria)

Nano enabled components are essential key parts for microfluidic applications - mostly in form of nano-enabled surfaces (NES) and nano-enabled membranes (NEMs). However, crucial challenges hinder the transfer of NES and NEMs into commercial microfluidic devices. Current production technologies (e.g. injection moulding) don't allow large volume upscaling of complex nano-patterned surfaces and the produced microfluidic components need to be handled in single pieces in all subsequent processes. Therefore, subsequent backend processing (nano-coatings, printing of nano-based inks, lamination of NEMs) demands for complex single peace handling operations. This restricts upscaling potential and process throughput.

The proposed project NextGenMicrofluidics addresses this challenge with a platform for production of NES and NEMs based microfluidics on large area polymer foils. This approach enables upscaling to high throughput of 1 million devices per year and more. The polymer foil technology is complemented with classic technologies of injection moulding and wafer based glass and silicon processing. These core facilities are combined with essential backend processing steps like high resolution biomolecule printing with the worldwide first roll-to-roll microarray spotter, printing of nano-enabled inks, as well as coating and lamination processes. These unique facilities will be combined and upgraded to a platform for testing of upscaling of microfluidic use

cases from TRL4 to TRL7. The services comprise device simulation, mastering of nanostructures, nanomaterial development, material testing, rapid prototyping, device testing, nano-safety assessment and support in regulatory and standardization issues.

The platform will be opened for additional use cases from outside of the consortium, and is therefore called Open Innovation Test Bed (OITB). The operation of such use cases will form the basis for self-sufficient operation of the platform after the project duration of 4 years

Role of BNN:

Within "NextGenMicrofluidics", BNN is responsible for the day-to-day management of the project. As part of the Project Management Board, it supports the Project Coordinator (JOANNEUM RESEARCH MATERIALS – Institute for Surface Technologies and Photonics) in all administrative issues as well as communication and dissemination activities as leader of WP 2 (Dissemination & Exploitation).

Moreover, BNN is responsible for the evaluation of potential hazards and safety issues in all Demo Cases as well as regulatory issues, and is closely working together with all partners. By implementing its safety strategy, the overall aim of BNN's nanosafety team is to ensure that all aspects of the involved processes will be conform to the "Safe by Design" concept for the technological development.

With regards to the Single Entry Point (SEP) of this Open Innovation Test Bed (OITB), BNN is responsible for the Quality Management Concept design.

For more details visit the project website www.nextgenmicrofluidics.eu.

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NextGenMicrofluidics project has received funding from the European Union's HORIZON 2020 research and innovation programme under grant agreement n° 862092.

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HI-ACCURACY EU project

High-ACCuracy printed electronics down to µm size, for Organic Large Area Electronics (OLAE) Thin Film Transistor (TFT) and Display Applications

- **Project duration**: 01 04 2020 - 31 03 2023 (36 months)
- **Total cost**: EUR 5 931 888,75
- **EU contribution**: EUR 5 220 869,25
- **Number of partners:** 11 beneficiaries
- **Coordinator**: JOANNEUM RESEARCH Forschungsgesellschaft mbH (Austria)

HI-ACCURACY aims to deliver the next generation of large area manufacture of flexible OLAE structures such as organic Thin Film Transistors (OTFTs) and Electroluminescent Quantum Dot Light Emitting Diode (EL-QD-LED) displays, to µm-scale feature size printable onto flexible substrates. This is aimed at the large and exciting printed, flexible and organic electronics global market, estimated at € 28.3bn with an annual growth rate of >8% which is mainly dominated by displays.

Hi-Accuracy will display front- and back-plane structures with feature sizes approaching 1 µm using low cost materials that can operate at frequencies of >1MHz. This will be achieved through a unique range of cutting-edge materials and printing inks, in combination with inherently scalable, cost-effective printing and deposition approaches, that have non vacuum or minimal vacuum requirement. Specifically, the electronic materials will include a range of low-temperature curable nano-Ag and nano-Au conductors and p-type organic semiconductors with intrinsic mobility of 10-20sq.cm/V.s as well as InP, ZnSe and ZnS Quantum Dot (QD) materials and electroluminescent EL-QD-LED material stacks with multilayer barrier layers that can achieve the required WVTR and oxygen transmission rates.

HI-ACCURACY is an ambitious project representing a pan-European EU consortium of world leading research centres and cutting-edge SMEs that are looking to develop and commercialise these technologies of European origin. The project is endorsed by three major global electronics companies: Huawei, Sony and Polar (global manufacturers of displays

and wearable health monitors) who will sit on the External Expert Advisory Board and steer the project towards commercialisation.

The final project demonstrators produced will be validated at the industrial facilities of one of the SME partners and the subsequent displays being further processed and tested by the end-user partners in their testing facilities (TRL5).

Online kick-off meeting

Due to the COVID-19 pandemic, an already planned kick-off meeting, with the coordinator JOANNEUM RESEARCH as host, was cancelled and replaced by a web conference. Thus, HI-ACCURACY was launched in an online kick-off meeting on April 15th, 2020, which was attended by 33 researchers from 11 partner organizations in 6 European countries. During the meeting, the entire consortium successfully planned the next steps. In addition, an External Expert Advisory Board was appointed during the meeting to facilitate a qualified external view. This Board will supply technical input throughout the entire project term. Despite this situation, the HI-ACCURACY project was successfully launched and the foundation for a successful project was laid.

Role of BNN:

BNN will develop an integrated (nano-)safety strategy to reduce the potential risk upon worker's exposure to manufactured nanomaterials (MNM) during processes/tasks involved in nanoprinting technologies. The activities include nanosafety assessment, Safe-by-Design implementation, interaction in the nanosafety-community on international level (e.g., EU NanoSafety Cluster), as well as dissemination and outreach activities.

HI-ACCURACY project has received funding from the European Union's HORIZON 2020 research and innovation programme under grant agreement n° 862410.

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SABYDOMA H2020 EU project

SABYDOMA - Safety BY Design Of nanoMaterials

- **Project duration:** 01 04 2020 - 30 09 2023 (42 months)
- **Total cost:** EUR 7 105 520
- **EU contribution:** EUR 5 969 751,25
- **Number of partners:** 19 beneficiaries
- **Coordinator:** University of Leeds (UK)

SABYDOMA is the acronym for "S*afety BY Design Of nanoMaterials - From Lab Manufacture to Governance and Communication: Progressing Up the TRL Ladder*", which is funded within the *Horizon 2020 research and innovation programme*. It is one of the four projects that have been funded under the NMBP-15 call (NMBP-15-2019 - Safe by design, from science to regulation: metrics and main sectors (RIA)). All four projects (SABYDOMA, SbD4nano, SAbyNA, ASINA) will work closely on their safe-by-design strategies and SABYDOMA's coordinator, Andrew Nelson, as chair of the WG E – Innovation & Safer by Design, will represent all them at the EU - NanoSafety Cluster.

In April 2020 (29th and 30th) the partners of the **SABYDOMA** project met, *virtually*, to kick off this brand-new Safety-by-Design project.

The SABYDOMA project addresses developments in the safety by design (SbD) paradigm by examining four industrial case studies in detail where the TRLs will advance from 4 to 6. Each TRL activity will progress from being lab based at TRL4 to being industry based at TRL6. The TRL4 activity will involve only innovation with regular industrial communication whereas the TRL6 activity will involve industrially located activities with innovation communication. One of the novel themes of this study is to use system control and optimisation theory including the Model Predictive Control (MPC) philosophy to bind the whole subject of SbD from laboratory innovation to the industrial production line and from decision making

processes to project governance. An equally important innovative step is the building of high throughput online platforms where nanomaterial (NM) is manufactured and screened at the point of production. The screening signal controls the NM redesign and production in a feedback loop. Screens will involve (a) physiochemical sensing elements (b) in-vitro targets of increasing complexity from the 2D biomembrane to cell-line and more complex cell-line elements; and, (c) multiple in-vitro targets with multiple end-points; developed in current H2020 projects. Two of the industrial studies include composite coating manufacture where the coating's stability and toxicity will be tested using a flow through microfluidic flow cell system coupled to online screens. This is part of the release and ageing investigations on the NM and NM coatings and the results of these will feed back to the production line design. At every step on the TRL ladder the in-silico modelling will be applied to optimise and redefine the relevant activities. By the same token regulatory and governance principles of SbD will be used to refine the technological development. The final deliverable will be four distinct technologies applying SbD to the four industrial processes respectively.

The partners of this project, which has a duration of 42 months (April 2020 – September 2023), come from academia, industries and research organisations from 15 European countries, Korea, Australia and Hong Kong and are experts in their fields, covering nanotechnology, nano engineering, nanosafety assessment, nanoregulation, nanoinformatics, nanomedicine, nanomaterials and emerging materials research. The project coordinator is Professor Laurence Andrew Nelson from the University of Leeds (United Kingdom).

Further information about the SABYDOMA project, updates on developments, and the role of BNN can be found here.

For more details visit the project website www.sabydoma.eu.

Get connected with SABYDOMA on:

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SABYDOMA project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement n° 862291.

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FlexFunction2Sustain

Project duration: 01 04 2020 – 31 03 2024 (48 months)

Total cost: EUR 16 163 107,50

EU contribution: EUR 14 231 400

Number of partners: 18 beneficiaries

Coordinator: Fraunhofer Gesellschaft zur Förderung der Angewandten Forschung e.V.

Let's rethink plastic! - FlexFunction2Sustain – Open Innovation Test Bed launched on 1st April to boost innovations for sustainable plastic and paper products to reach the market faster.

On 1st of April 2020, the EU-funded initiative FlexFunction2Sustain was launched. The project, financed by the European Union's Horizon 2020 research and innovation programme, will support Plastics and Paper Processing Industry in overcoming environmental challenges while entering the digital age. 19 European partners unify their competencies, practical and business development expertise and technical infrastructure to provide a wide access to innovative solutions through a sustainable open innovation ecosystem. This Open Innovation Test Bed for nano-functionalized plastic and paper surfaces and membranes will support innovative SMEs and industries by drastically reducing the time-to-market for novel concepts, ideas and products.

Nano-functionalisation for smart and sustainable plastic surfaces

Plastic and paper-based materials are used in a wide range of daily life products. Applications represent well established multi-billion Euro markets (e.g. food and pharma packaging, furniture surfaces, membrane-based filter systems, medical products etc.). New business opportunities will arise from replacing glass and metal by nano-functionalized plastic or paper surfaces in many products. That allows the reduction in weight and cost and gains in mechanical flexibility together with additional properties. Such properties include e.g. the blocking of water and oxygen permeation, surface conductivity, antimicrobial and anti-viral properties or chemical and corrosion resistance. State-of-the-art solutions often rely on composite or multi-layer materials. Such composites, however, have a major drawback with

respect to their environmental footprint: they are neither fully recyclable nor compostable / degradable. Further, most plastic products are synthesized from mineral oil instead of renewable resources.

Many innovations come from the urgent need to reduce plastic waste in the world addressing novel polymer formulations (bio-based, bio-degradable) and novel product designs. However, high access barriers to pre-commercial material development, testing and certification facilities and pilot-production capabilities in Europe prevent StartUps, SMEs and Industries from commercially exploiting novel ideas in nanotechnology and advanced materials. Investors, although willing to support innovative solutions, lack the technical knowledge and the institutional capabilities for evaluating new ideas, products and business models of StartUps.

FlexFunction2Sustain - who is behind it and how does it work?

The EU-funded initiative FlexFunction2Sustain aims at overcoming these limitations (often referred to as “Valley of Death” between research and industry) by creating an Open Innovation Test Bed (OITB) for nano-functionalisation technologies that enable sustainable and smart plastics and paper-based products. The OITB will provide users an easy access to holistic innovation boosting services through a single entry point. The OITB will support its customers in material and product design, in process and product development, in product verification and certification, with pilot and small series production services and with accessing new markets and business opportunities. Integrating all these services to a complete, all-round offer will substantially reduce the time and cost to progress through the innovation chain from an idea to a successful product.

FlexFunction2Sustain uniquely interconnects renowned Universities, Applied Research Organisations, and Companies offering pilot production services with Business Development, Networking and Intellectual Property Experts to support customers in any stage of the innovation chain. The consortium was assembled to improve competitiveness of Europe in the field of nano-functionalized materials, and to increase market share of European industries in the value chain of sustainable and smart plastic and paper related products.

FlexFunction2Sustain member facilities cover all major nano-functionalisation techniques available for plastic and paper surfaces. This includes a large portfolio of techniques for atmospheric pressure and vacuum thin film coating; micro- and nano-structuring of surfac-

es; printed electronics processing; and lamination and product integration. Pilot-scale facilities for testing novel polymer formulations and for verifying recyclability and biodegradability of innovative products complete the offer. Finally, application verification and pre-certification test facilities for food and non-food packaging and anti-microbial and antiviral applications will accelerate market penetration of novel products in sensitive use scenarios. FlexFunction2Sustain will align the technical facilities according to the needs of six industrial use cases, including i.e.:

- recyclable and marine degradable food and cosmetic packaging,
- selective water filter membranes,
- innovative and smart plastic surfaces in automotive and
- bio-degradable security and fraud protection labels.

Project coordinator Dr. John Fahlteich, Fraunhofer Institute for Organic Electronics, Electron Beam and Plasma Technology FEP, explains the unique potential of the ecosystem: “The strength of the FlexFunction2Sustain OITB is the unique cooperation between the research, technology and business development partners to set-up a combined offer of complementary services for boosting innovation. Customers will be able to gain access to a pan European innovation network through a single entry point without the need to speak multiple languages or to understand the law in multiple countries. This model allows the most appropriate technology selection and shaping among whole technological portfolio available in the EU. Users can expect optimum cost, time-to-market, reliability and performance.”

Holistic services from a Single Entry Point in the whole European Market

The services of the OITB will be made available to the industry though a novel “single entry point” company that will be created before Summer 2021. The company will act as general contractor for the customer managing all services and actions of the OITB for highest service quality and efficiency. Through this company, the customer will gain access to services from partners in more than 10 different EU countries in either its native language or English. The single entry point will eliminate the need to negotiate multiple service contracts in different countries and to organize material transfers and information exchange between different suppliers. Strategic partnerships with regional agents will ensure access in the whole European Market.

To accelerate the uptake of the OITB services, FlexFunction2Sustain will launch two competitive calls for up to 20 pre-commercial SME-targeted pilot cases. The first call will open in

January 2022 and will invite SMEs to submit innovation project proposals to FlexFunction2Sustain. The best rated projects will receive discounted services from the OITB.

The FlexFunction2Sustain ecosystem will support innovative SMEs and industries by providing an expert support from an early development stage to the optimised transformation of prototypes into valuable and innovative products. The members of the consortium are convinced that only the complex response of this nature will provide the necessary service portfolio to create sustainable new products and business cases in the European Union.

In 2015, packaging materials contributed 141 million tons to the global plastic waste generation. FlexFunction2Sustain will promote technologies and innovations to replace state-of-the-art packaging by sustainable solutions for a substantial reduction of plastic waste in the world. © Fraunhofer FEP

Role of BNN & JOANNEUM RESEARCH:

BioNanoNet member JOANNEUM RESEARCH is beneficiary of the project FlexFunction2Sustain and BNN is part of the Advisory Board.

For more details visit the project website www.flexfunction2sustain.eu.

FlexFunction2Sustain project has received funding from the European Union's HORIZON 2020 research and innovation programme under grant agreement n° 862156.

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BNN *Member Contributions*

Contribution from Bionano Team, University of Ljubljana

Report of the NSC (nano) TiO2 safety communication task force

The goal of the (nano)TiO2 safety communication task force of the EU NanoSafety Cluster (NSC) was to provide scientific input to the ongoing discussions on the safety classification of titanium dioxide. The TF on TiO2 safety communication ran from January 2018 to January 2019. The TF members communicated via mail, Skype and face-to-face at different scientific meetings. They collected information regarding TiO2 classification itself and information on TiO2 hazard potential from available scientific literature. All contributors agreed that the issue of “TiO2 safety communication” is a very complex issue which has more dimensions. Some contributors concluded that communication of science to non-scientists should be responsibility of scientists. It is not sufficient to rely on science journalism to be responsible for the understanding of science. In the future, convergence and networking, pragmatic consensus-based minimum standards and communication technique could enable translating scientific findings into society. There is never only one or a few scientific papers enough to communicate scientific findings. The core issue is in explaining facts and findings to prevent from being misunderstood and this has to be done by the scientific community and not left to non-scientists.

Some members of the TF group will continue working on the issue of nano risk communication in the ongoing H2020 Nano risk governance projects Gov4Nano, NANORIGO and RiskGONE.

The message the Task Force members would like to give is that scientists should not interfere with regulatory decision-making at any stage. What they should do is communicate science. Moreover, scientists should establish standards for science communication and

this could be one of future challenges for the NSC. Some of us continue this task in the on-going nano-risk governance projects.

The (nano)TiO2 Safety Communication Task Force

The Task Force the "(nano) TiO2 safety communication" was initiated by Damjana Drobne (University of Ljubljana, Slovenia). The goal of the (nano) TiO2 safety communication Task Force (TF) of the EU NanoSafety Cluster (NSC) was to provide scientific input to ongoing classification of titanium dioxide. The TF on TiO2 safety communication ran from January 2018 to January 2020, and this is the summary report. The TF members communicated via mail, Skype and face to face at different scientific meetings. They collected information regarding TiO2 classification itself and information on TiO2 hazard potential from available scientific literature.

Following completion of the work of the TF in January 2020, the final report and slide from the relevant webinar (which took place in May 2020) are now available to view and download here.

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Contribution of CIBER-BBN

CIBER-BBN and Nanbiosis Research during COVID-19 pandemic outbreak

In order to speed up research into the coronavirus, CIBER-BBN groups are currently working in several research projects and initiatives to tackle the COVID-19 pandemics.

European project CONVAT

The European project **CONVAT** is coordinated by Prof. Laura Lechuga, head of Nanobiosensors and Bioanalytical Applications group of CIBER-BBN at ICN2-CSIC and Scientific Director of Nanbiosis U4. The project is one of the 17 proposals awarded by the European Commission to advance the knowledge about the Coronavirus disease.

CONVAT will develop a point-of-care platform, for rapid diagnosis and monitoring of coronavirus, directly from the patient's sample and without the need for testing in centralized clinical laboratories. The new device based on optical biosensor nanotechnology is expected to become massively available in less than 12 months. The project indeed aims to extend beyond the current pandemic and the human diagnosis. The new biosensor will also be used for the analysis of different types of coronavirus present in reservoir animals, such as bats, to observe and monitor possible evolutions of these viruses and prevent future outbreaks in humans. The test is a biosensor that uses nanophotonic, and it will be used in two devices: one will detect virus proteins, while the other, its genetic material. This diagnostic test is based on a chip that implements one of the most sensitive measurement techniques in physics: photonic interferometry. Specifically, a beam of light undergoes small but measurable changes alerting the presence of the virus in the sample. The project was awarded with the Physics, Innovation, and technology Award of the Royal Spanish Physics Society (RSEF) and the BBVA Foundation. Click HERE for more information.

POC4CoV project

The POC4CoV project coordinated by the *Nanobiotechnology for diagnostics group* (Nb4D) of CIBER-BBN at the IQAC-CSIC led by Prof. M.-Pilar Marco worked on the development of new and rapid diagnostic tools. The new strategy proposed is based on two fundamental aspects: on one hand the technology which is based on the current knowledge of some of

the CSIC´s research groups in micro and nanotechnologies and on the other hand, in the selection strategy of the antigens that will produce a more specific and sensitive response to the SARS-COV-2

The time required to develop these tests is relatively short since researchers have the advantage of having detection technologies already developed and tested in other types of projects, but even so, these tests need between 6 and 8 months of development to obtain the first prototypes that, obviously, will have to be validated so that they can be made available in the market in a safely. Therefore, **the new tests will help us to be much better prepared before the new waves of the pandemic** expected by the epidemiologists. Click HERE for more information.

Early diagnosis of COVID-19 through mobile phones

CIBER-BBN researchers of the BSicos group from the I3A (Engineering Research Institute) of the University of Zaragoza) leaded by Prof. Pablo Laguna are working on a research solution for the early diagnosis of COVID-19 cases, through the development of an App for mobile phones. The group is working on the European project WECARMON (Wearable Cardiorespiratory Monitor) for the development of an ambulatory system that would allow monitoring the cardiac and respiratory rhythm of patients with Clinical Obstructive Pulmonary Disease (COPD) and thus control and predict episodes of worsening of the disease. However, **the current situation of pandemic due to the SARS-CoV-2 coronavirus has led the researchers,** with the approval of the European Commission, **to temporarily redirect their objective, focusing their work in search of solutions for the early diagnosis of the COVID-19**.

The work carried out for patients with a respiratory disease such as COPD could now serve for the early detection of people with symptoms of COVID-19, before even having fever, but also for asymptomatic people, since the rapid variation of these parameters is known. in the initial stages of other respiratory conditions. Our researchers will use these cardiac and respiratory parameters, indirect markers of the autonomic nervous system and, therefore, sensitive to the response of the immune system, potentially helping to identify possible cases of COVID-19 earlier. A technological tool that could join the fight to control this pandemic. The WeCarmon project is an MSCA-IF whose objective is to promote the professional career of young and brilliant researchers as the work done by Dr. Jesús Lázaro under the supervision of Prof. Pablo Laguna and BSicos team. Click HERE for more information.

A recombinant SARS-CoV-2 vaccine

Researchers from the Protein Production Platform (PPP) of Nanbiosis and CIBER-BBN at the Autonomous University of Barcelona are involved in a micro-patronage project for the development of a vaccine for COVID-19. The Nanbiosis Unit 1 is directly involved in the initial part of the virus like particles and proteins expression and purification project of SARS-CoV-2. The project proposes to use a new vaccine strategy based on recombinant proteins in imitation of viruses (virus-like particles or VLPs). The same strategy with which, for example, papillomavirus and hepatitis B virus vaccines have been created. These particles can arouse a strong immune response as they from a three-dimensional structure where the virus epitopes are exposed but in a safe manner.

The project will design the genes that encode the structural proteins of the virus using bioinformatics tools, the production and purification of the cultured cell lines with introduce the genes that encode the virus proteins and lastly the validation with patient serum of the COVID-19 and cell models prior to preclinical phase in animal models for safety and efficacy of the vaccine testing. Click HERE for more information.

Stem Cells and COVID-19 research

Researchers from the Malaga Academy of Sciences has published an interesting review by Prof. José Becerra Ratia on the Spanish biomedical research in relation to COVID-19 virus and two therapeutic novelties that have stem cells as protagonists, in one case the mesenchymal cells and in the other case the embryonic ones. Professor Becerra is Professor of Cellular Biology at the University of Malaga and Vice President of the Malaga Academy of Sciences, as well as Researcher in charge of the Bioengineering and Tissue Regeneration Laboratory that belongs to BIONAND, IBIMA CIBER-BBN and TerCel (unit 28 of NANBIOSIS U28 Nanoimaging Unit). Prof. Becerra, emphasizes how the development of Biology in recent decades as well as the powerful tools provided by molecular biology and artificial intelligence, will be very useful now to combat COVID-19 Pandemia. Click HERE for more information.

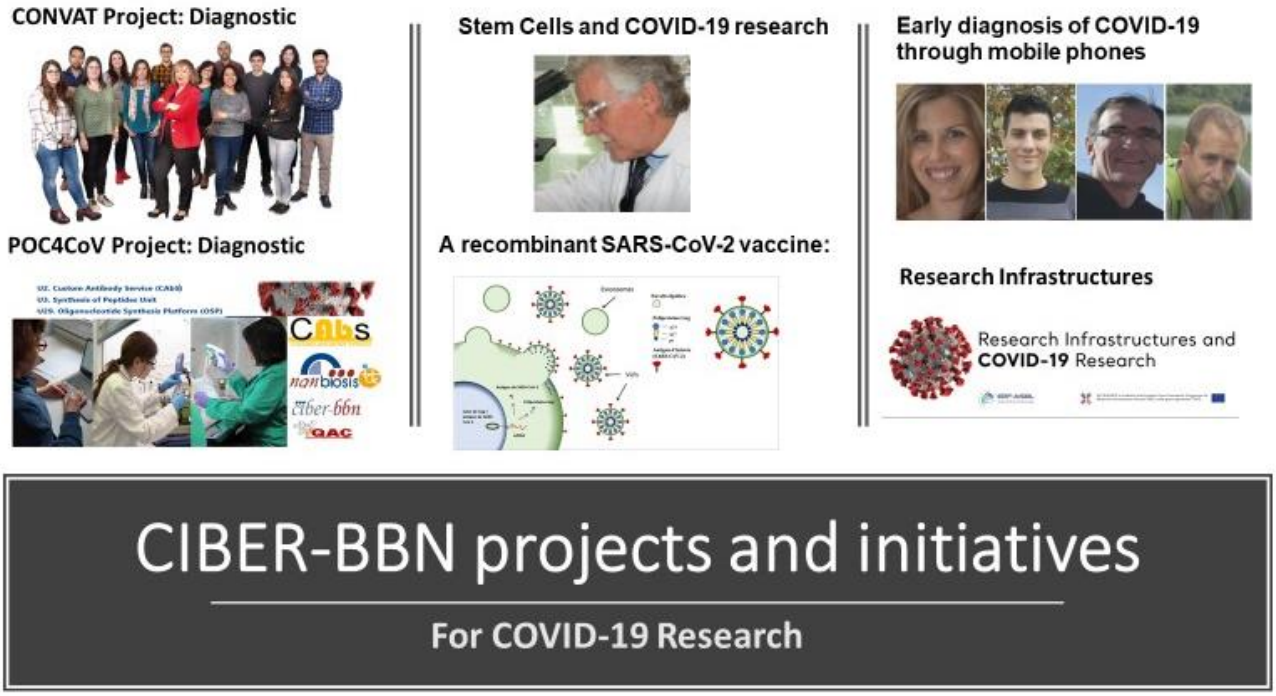
Nanbiosis Research Infrastructure coordinated by CIBER-BBN among the European Research Infrastructures working for COVID-19 pandemics

In response to the **COVID-19 pandemic**, several **research infrastructures (RIs)** NANBIOSIS among them, have set up specific services, such as rapid or fast track access, to allow researchers to obtain results as soon as possible. The Association of European-

Level Research Infrastructures Facilities (ERF-AISBL), collects the relevant information about the initiatives on a dedicated website.

NANBIOSIS provides rapid access for COVID-19 research. The ICTS offers preclinical stages services of biomedical product development, specifically, synthesis and preparation of biomolecules like antibodies, peptides, recombinant proteins, oligonucleotides for diagnostic therapeutic and prophylactic purposes. NANBIOSIS assigns high priority to the projects related to the SARS-CoV-2 virus offering preferential access. For that purpose, A "COVID-19 Rapid Access" call has been established, valid through the year 2020. Urgent procedure will be applied to review and admission of the proposals.

www.nanbiosis.es/call



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Contribution of FLUIGENT

Use case of the new Fluigent Aria

This note describes the use of the new Fluigent **Aria** – a software-assisted instrument capable of delivering of up to 10 different solutions – for the **automation of a rare cell capture and detection method** including surface treatment, beads and cells solution injections, and immunostaining. We use the EPHESIA microfluidic chip from Institute Curie and MDA-MB-231 breast cancer cell line as a demonstration of system function and utility.

Cell capture and labelling are usually time-consuming processes that can last for several hours, and often require exposure to multiple fluids. Cell labelling, cell manipulation, drug screening or perfusion also demand very precise injection volumes with the use of controlled flow rates (ranging from 1 µL/min to 1 000 µL/min) in order to perform reproducible experiments. **Aria is the perfect instrument to address these concerns and automate complex fluid delivery protocols.**

Materials and method

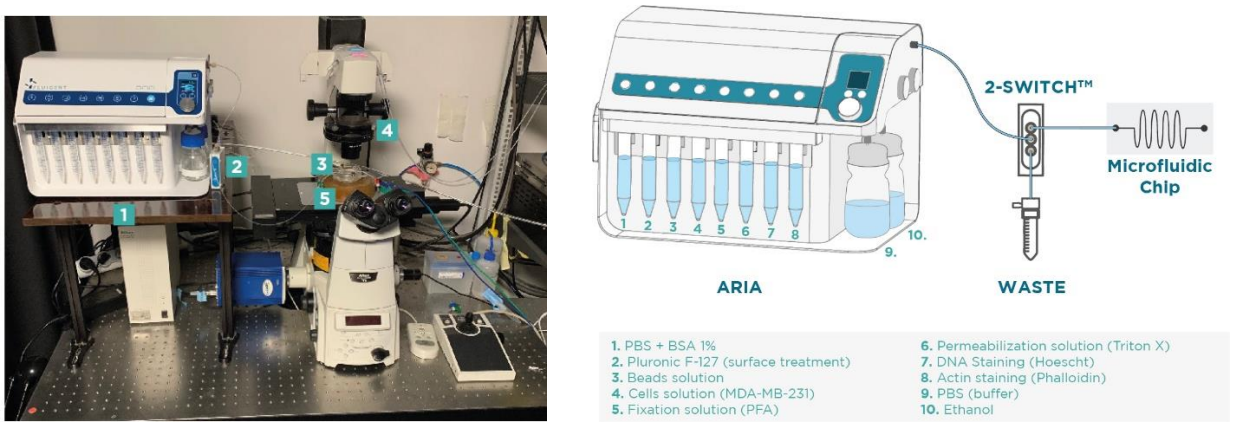

Figure 1: System setup. Aria and a valve are connected to the EPHESIA microfluidic chip. The 10 solutions to be injected are present inside the reservoirs.

Aria is connected to a pressure source and a computer for real-time flow control. The EPHESIA chip is connected to Aria**.** Antibodies-coated magnetic beads are arranged into a sieve of columns inside the chip that allow the capture of targeted cells. The sample to ana-

lyse is pumped through the chip and the cell's captured on the columns were labelled to stain nucleus, actin filaments and damaged DNA within the nucleus. All the injections using precise flow rates and waiting steps are automated using the software of Aria: Setup preparation and surface treatment step - Beads injection and cells injection step - Fixation, permeabilization and staining step (figure 2).

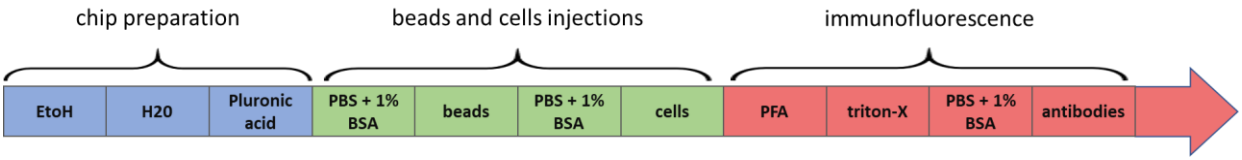

Figure 2: Schematic of the solutions automatically injected during the protocol using Aria's software.

Results

Once columns are formed within the microfluidic chip, the solution containing MDA-MB-231 cells was subsequently injected and the staining injection is next performed. We can observe in figure 3 a) that several cells that specifically bind to the anti-EpCAM coated columns. In figure 3 b) we can distincly observe orange fluorescence indicating stained actin filaments, blue fluorescence indicating stained nucleus and green fluorescence indicating damaged DNA within the nucleus. These results confirm the proper function of the beads and cells injection protocols, and staining injection protocol.

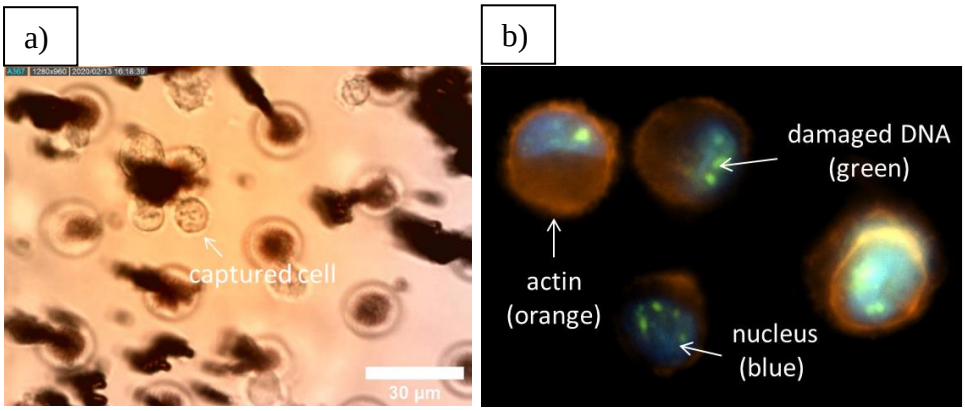

Figure 3: a) Micrograph of MDA-MB-231 cells captured on the columns b) Composite image using blue, orange and green fluorescent filters

Conclusion

We have demonstrated the use of Aria and its related software for the automated delivery of different liquids for the capture and labelling of breast cancer cells using a complex microfluidic setup. This protocol included 10 different liquid injections, surface treatment, beads injection, cells injection, capture and labelling in a sequential and automated manner.

For more information regarding this note, please visit our website: https://link.fluigent-deutschland.com/AriaBNN

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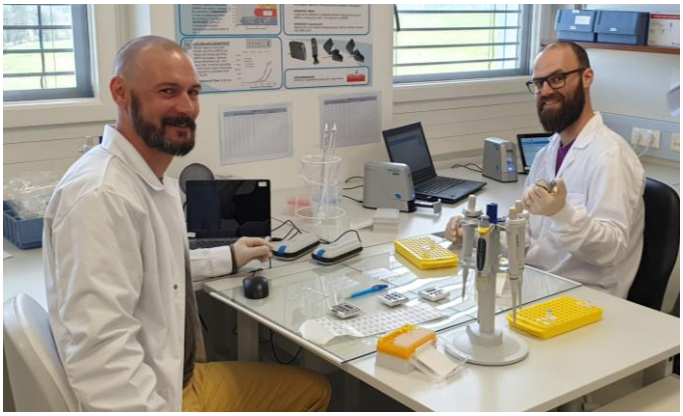
Contribution of GENSPEED

GENSPEED is funded by the Austrian Research Promotion Agency (FFG) for the development of a novel COVID19 rapid test

GENSPEED Biotech GmbH has received a grant from the Austrian Research Promotion Agency (FFG) for the development of a novel COVID-19 rapid test within the framework of the emergency call for research on COVID-19. In a first version, the test will allow the detection of antibodies against the virus in a single drop of blood within 15 minutes. In the final version, the test will simultaneously detect the immunological status and an acute infection with SARS-CoV-2. This will be the first Covid-19 point of care test to identify immune or acutely infected individuals on site, quickly and reliably. Such assay can literally be used in any possible setting ranging from the general practitioner's office to testing of staff and visitors in healthcare facilities or companies, or even travellers at airports.

Early detection of acute infections with SARS-CoV-2 is essential to prevent the rapid spread of the virus. However, PCR-based tests for the detection of an acute viral infection usually take several hours and must be carried out in the laboratory. The result may only be available the next day at the earliest. On the other hand, in the wake of the COVID-19 pandemic, it is becoming increasingly important to determine whether people have already been infected with the virus and have acquired immunity. For this purpose, it must be determined whether there are virus-specific antibodies present in the blood. However, the conventional laboratory antibody assays take several hours, and the strip-tests for detecting the antibodies tend to be unreliable.



Ingo Katzmayr (left) and Michael Vogl (right) developing new GENSPEED tests in the laboratory. © GENSPEED Biotech

Novel dual COVID-19 rapid test under development

GENSPEED Biotech will now develop a new test format based on the existing GENSPEED technology as part of the FFG-funded project. In the final stage of development, the combined test will allow the simultaneous detection of viral antibodies as well as virus particles on site and in laboratory quality within only a few minutes. A single drop of blood from the fingertip and a nasal or throat swab will be sufficient to obtain the complete information. The GENSPEED protocol with less than 1 minute sample preparation and 15 minutes automated on-chip analysis conveniently provides the electronic results on a tablet computer. For clinical evaluation GENSPEED Biotech is working with recognized medical research partners such as the Medical Faculty of the Johannes Kepler University, the Medical University of Graz, as well as the Ludwig Boltzmann Institute and the BOKU in Vienna.

Added value for everyone

In the near future, GENSPEED tests will provide immediate results at the point of need. This will eliminate the often costly and time-consuming sample logistics and delays. There are significant advantages for many areas: For example, more safety for medical and nursing professionals through simple and fast onsite testing, closures of pubs, shops or public institutions can be avoided if visitors can be tested before entry, more specific and local measures can be implemented based on the results, travel activities can continue after rapid testing and much more!

Dr. Sonja Kierstein, CTO of GENSPEED and project manager: "We are incredibly excited about the project, because we can make a significant contribution to the containment of the virus and are proud to be the only Upper Austrian company to be funded by FFG". Dr. Max Sonnleitner, CEO of GENSPEED Biotech, is convinced that the test can be of essential importance both for people's health and for the economy: "Having a reliable test result directly on site and in a few minutes can help to return to true normality in many areas of life!"

Dr. Sonja Kierstein (CTO) and Dr. Max Sonnleitner (CEO) with the compact GENSPEED® Point-of-Care Testing technology. © Indrich Photography

In any case, the first COVID-19 measurement results are very promising.

Precise, laboratory-like results within a few minutes

GENSPEED Biotech offers a technology platform on which a new generation of rapid tests can be developed for medical diagnostics and various industrial applications. The technology combines microfluidics, miniaturized optoelectronics and automation into a compact, easy-to-use, reliable and CEcertified test system. As a multiplex Point-of-Care Test (xPOCT), the system allows the detection of up to 20 different analytes, such as bacteria, viruses or biomarkers in blood and other sample materials within minutes. The new test is based on a modified chip format (patent pending), which considerably expands the range of applications.

The GENSPEED® technology will allow the rapid and simultaneous detection of antibodies and acute virus infections

© Wagner Gerhard Photography

The new COVID19 COMPLETE rapid test will enable the determination of the immune status with simultaneous detection of an acute virus infection from a drop of blood within a few minutes (exemplary figure).

© Wagner Gerhard Photography

GENSPEED Biotech is BioNanoNet-member and project partner in the Open innovation test bed NextGenMicrofluidics.

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Contribution of Graz University of Technology

Pollen measurement system developed at TU Graz analyses pollen fast, cheaply and automatically

Researchers at Graz University of Technology have successfully tested a cost-effective and fully automated pollen sensor prototype and are now making their knowledge freely available and usable for everyone.

Olga Saukh (l.) and Nam Cao are working together with researchers from ETH Zurich on a fully automated pollen measurement system. © Lunghammer - TU Graz / ITI

Pollen: essential for the pollination of many plants, but the bane of allergy sufferers. Pollen warning services provide information about daily exposure and allergy risk and are an important source of information for affected persons. For common data collection, pollen traps are used which continuously measure the pollen content in the air. To do this, they use a built-in electric motor to suck the ambient air into a drum where the pollen in the air sticks to an adhesive strip. Professionally trained persons then evaluate the pollen microscopically and grade it. However, the procedure is costly and time-consuming. Automated solutions are currently too expensive and only suitable for a limited number of pollen species. Olga Saukh and Nam Cao, two researchers from the Institute of Technical Informatics, have now joined forces with a team from ETH Zurich to develop a prototype of a pollen measurement sensor that could dramatically simplify the entire process – from catching the pollen to recording and evaluating it.

Simple, inexpensive, lightweight

The pollen measurement system consists of two parts: a measuring device, which includes a pollen trap, a particle concentrator and a digital transmitted light microscope, and a cloud service, in which the microscopically recorded pollen images are analysed. The prototype is particularly light (8 kg), compact (30 cm x 40 cm x 44 cm), energy-saving (the power consumption is 6W) and can be implemented at low cost. "The material costs amount to around 1000 euros," says Olga Saukh. In comparison: currently available fully automated pollen measuring devices cost up to 100,000 euros.

The pollen trap has six inlets that can collect pollen from all directions of flight. “We’ve been inspired by modern vacuum cleaner technologies and use a cyclone to collect the pollen samples, as is used for bagless vacuum cleaners that collect the sucked up dirt in a collection container," explains Nam Cao.

Further information on Olga Saukh's research can be found in the Planet Research article "Human and Machine Interaction in Complex Systems".

How the pollen measurement sensor works

The pollen lands inside the device on a clockwise rotating glass plate which is covered with a thin layer of glycerine. The glycerine fulfils two essential tasks. On the one hand, it ensures that the pollen grains stick to the glass surface. On the other, it improves the quality of the images that the microscope sends to the cloud. "Glycerine is transparent, does not evaporate and is also suitable for outdoor use due to its thermal stability," says Olga Saukh, explaining the choice. Using a standard paper cutting blade, the glycerine-soaked pollen are concentrated to a thin line. The narrower this line is, the more pollen can be recorded under a microscope and then analysed. The pollen is then automatically wiped off the plate such that the system can work autonomously for a long period of time.

Machine learning algorithms analyse the pollen

Up to 100 microscopic images are uploaded to the cloud in 30 seconds. An object recognition software identifies and classifies the pollen grains on the basis of various characteristics. In field trials, the pollen recognition model correctly recognized pollen in 90 percent of cases.

In order to be able to train and further improve the model using machine learning algorithms, the researchers manually annotated a subset of the recorded data. Now the researchers are working on further advancing the evaluation of the pollen. "This is an ongoing process, where we depend on the support of pollen experts," says Olga Saukh, referring to two open source platforms. The dataset is publicly available on the Zenodo platform. The hardware design and the image processing code are provided on the online service GitHub.

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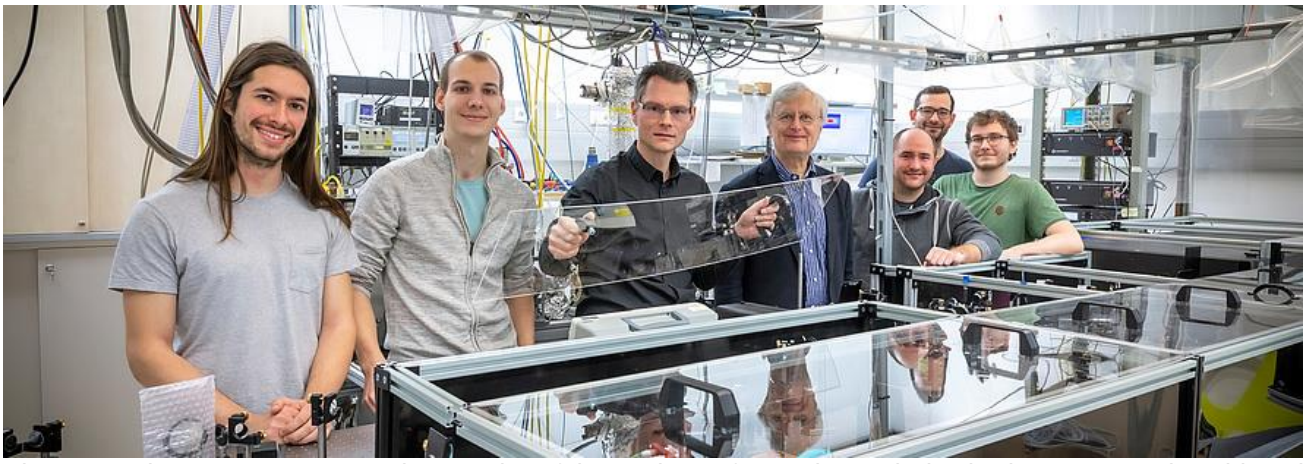
Contribution of Graz University of Technology

Researchers observe ultrafast processes of single molecules in liquid helium for the first time

Graz University of Technology researchers describe in Physical Review Letters how a molecule moves in the protective environment of a quantum fluid.



The research group Femtosecond Dynamics of the Institute of Experimental Physics has once again achieved a success in quantum physics. From left to right: The study authors Pascal Heim, Bernhard Thaler and Markus Koch with the former head of the institute Wolfgang Ernst and the colleagues Stefan Cesnik, Leonhard Treiber and Michael Stadlhofer. © Lunghammer - TU Graz

Markus Koch, head of the research group Femtosecond Dynamics at the Institute of Experimental Physics at TU Graz, and his team develop new methods for time-resolved femtosecond laser spectroscopy to investigate ultrafast processes in molecular systems. In 2018 the group demonstrated for the first time that photo-induced processes can be observed inside a helium nanodroplet, a nanometer-sized droplet of superfluid helium that serves as a quantum solvent. For their investigations, the researchers placed a single indium atom inside the droplet and analysed the reaction of the system with the pump-probe principle. The atom was excited with an ultrashort laser pulse, triggering the rearrangement of the helium environment within femtoseconds (10-15 seconds). A time-delayed second laser pulse probed this development and provided information on the behavior of the system.

Successful next step

Using the same technique, Koch and his colleagues Miriam Meyer, Bernhard Thaler and Pascal Heim, visualized the movement of single, isolated molecules inside a helium droplet for the first time. The researchers formed an indium dimer molecule inside a helium droplet

by loading it successively with two indium atoms. They then triggered a vibration in the molecule by photoexcitation and observed the movement of the nuclei in real time with the same pump-probe technique.
The researchers consider two aspects of the experiment as particularly important: First, it demonstrates that such experiments are able to observe ultrafast intramolecular processes - i.e. processes that occur within an excited molecule.

Helium has little influence on embedded molecules

Second, the group discovered that the influence of superfluid helium on molecular vibrations is significantly weaker than with conventional solvents, such as water or methanol. Intramolecular processes are usually influenced by interactions with the environment and in conventional solvents this interaction is so strong that intramolecular processes cannot be observed, as Bernhard Thaler explains: "The quantum fluid helium, which has a temperature of only 0.4 K (note: minus 272.75 degrees Celsius), is truly special, as the perturbation on the embedded molecule is very low. Additionally, fragile molecules, which often break apart in other techniques, are stabilized due to the cooling mechanism and can now be investigated."

Markus Koch wants to extend the method to complex molecules

"We see great potential in helium nanodroplets because they offer wonderful opportunities for creating molecular systems," said Koch, explaining why he and his team develop this method for femtosecond studies. In the next step, the Femtosecond Dynamics group aims for more complex systems. "The structure of indium molecules, which we used as a model system, is very simple but in the future we want to look at technologically relevant molecules, which are more complex. I consider this as promising approach to molecular engineering, where future materials are developed by manipulating the quantum behavior of their molecular constituents."

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Contribution of Graz University of Technology

Using measuring instruments to protect against explosion

Doctoral student Manuel Maier from TU Graz's Institute of Process and Particle Technology received the Anton Paar Research Award for a measuring instrument that controls reactions of highly reactive substances.

Manuel Maier (right) with Professor Heidrun Gruber-Wölfler and colleague Michael Leitner – the research team behind the award-winning project. © Lunghammer – TU Graz

Manuel Maier stands in the middle of the scientific hustle and bustle of the laboratory with the cool demeanour of a mountain lake. The only blob of excitement is his frog-green jacket that peeps out from under his white lab coat. He has buried his hands in his trouser pockets while quietly talking about his research, which has just won him the research prize of the Styrian company Anton Paar.

Continuous Flow Calorimeter

"We're doing research with some pretty horrendous substances here," Maier explains and smiles. "That's why it's so important to have measuring devices like a calorimeter that can accurately measure and control reactions." A calorimeter can be used to determine exactly what heat is released during a chemical reaction. Especially in the pharmaceutical industry and with specialty chemicals, highly reactive substances are used which are not only highly efficient but also particularly sensitive: "Some of these substances ignite immediately in air

and some are highly toxic." But because they are highly reactive, they can be used in very small quantities. This is where microreaction technology comes into play, which is the focus of the CCFlow project, among others. Manuel Maier is a PhD student in this project and is responsible for the design of small reactors specializing in certain chemicals, which are produced in a 3D printer. "We want to go from the individual requirements of the chemical industry to a tailor-made reactor that can be produced using a 3D printer. With this design concept, we want to significantly reduce the time needed to develop new types of facilities for the production of active ingredients in quantities for clinical studies." The project uses not only the in-house knowledge at TU Graz and the RCPE competence centre, but also the know-how and infrastructure of scientific and industrial partners.

From batch to flow

The current trend in the pharmaceutical industry is the continuous production of drugs, which also includes flow chemistry. Traditionally, the desired substances are produced in batches – in a kind of large stirred tank. Usually, all the chemicals required for this are placed in a large vessel and the reaction takes place step by step in this or other stirred vessels. In flow chemistry, this selective, discontinuous process is converted into a continuous process. The necessary chemicals are conveyed into a pipe system in which reaction processes then take place and at the end the desired substance is continuously released. "The commercially available measuring instruments are designed for batch production," explains Maier. "If the process method changes, then the measuring instruments must also be adapted in order to obtain the desired result. Without a knowledge of the highly reactive substances used, explosions could even occur."

Further information about the COMET K-Project CC Flow can be found on the project website.

Explosive in everyday working life, calm in private

In everyday working life, things are therefore not exactly without danger for the 28-year-old. Privately, the Styrian scientist likes it a bit quieter. He’s happy to commute from his home town Feldbach to Graz: "I find the combination of working in the city and living outside perfect. I come home, put on my running shoes and in five minutes I'm in the forest. There, it’s quiet and relaxing." Maier is also a passionate musician, so it is not quite so quiet in private: "I play the drums, which gives me a chance to relax after work and it's a great balance."

The future lies in heat measurement

Manuel Maier still has a good year to complete his PhD. It is not yet clear what will happen after that. "But I would like to continue working on our calorimeter. It would be great if a measuring device based on my concept could be built later and also sold on the market."

This research area is anchored in the Field of Expertise “Mobility & Production”, one of five strategic foci of TU Graz.

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Contribution of JOANNEUM RESEARCH

Mini-labs for rapid diagnostic tests will soon be mass-produced in Europe

© JOANNEUM RESEARCH Materials

The European Commission has awarded 15 million Euros to an international consortium carrying out extensive research into the next generation of lab-on-a-chip systems. So-called mini-labs using foil-based microfluidics for rapid diagnostics kits can then be mass-produced in Europe, with possible application in COVID-19 detection.

There is great potential for microfluidic lab-on-a-chip systems, particularly in medicine, pharmaceuticals, production and analysis. The H2020 project, "NextGenMicrofluidics", was granted to a consortium coordinated by JOANNEUM RESEARCH, an Austrian Research and Technology organisation. The partners of NextGenMicrofluidics operate an Open Innovation Test Bed, a new EU format similar to pilot lines. "One advantage of lab-on-a-chip systems is that they allow the automated implementation of complex analyses even in small laboratories with limited technical equipment," said Martin Smolka, Project Manager, JOANNEUM RESEARCH. "This joint project accelerates the implementation of roll-to-roll

technologies for the high-throughput production of microfluidic systems. We will then produce microfluidic components no longer as single pieces, but on large foils using stamping, printing and lamination processes. This works in a similar way to newspaper printing. As a result, we will be heading towards an unrivalled level in the production capacity of flexible lab-on-a-chip systems, so-called labs-on-a-foil", stated Smolka.

NextGenMicrofluidics is addressing this challenge by establishing an Open Innovation Test Bed for the development and production of lab-on-a-foil systems on large area polymer foils. This will enable mass production of several million lab-on-a-foil systems per year, important, for example, for the production of rapid tests for medical diagnosis. Smolka explained some technical details: "Injection molding and wafer-based glass and silicon processing complement the platform as well as other technologies such as high-resolution printing of biomolecules in the form of the world's first roll-to-roll microarray spotter for foil-based microfluidics. These unique facilities are combined in the Open Innovation Test Bed."

The Open Innovation Test Bed offers all services required for the development and production of microfluidic systems. These services range from simulation based design through molecular assay development, material development and biofunctionalisation to production as well as quality assurance.

As a one-stop shop for this unique technology portfolio, the Open Innovation Test Bed offers its customers the advantage of a fast and cost-effective transfer of new diagnostic or analytical concepts into ready-for-market products. Thus, with microfluidic systems novel, pioneering innovations can be attained at competitive prices.

Within the framework of the project, the consortium offers funding opportunities for innovation projects, in which future customers will be able to contract for product development. Parallel to the technical development, the Open Innovation Test Bed will provide its customers with access to venture capital.

Point-of-Care-Diagnostic for SARS-CoV -2

The technology validation of the Open Innovation Test Bed is established on pre-defined case studies from complementary markets, ranging from biosensor development through

molecular diagnostics and smart phone-supported home diagnostics to pharmaceutical tests as well as sensors for monitoring bioprocesses and food safety.

Particular attention is paid to lab-on-a-foil systems in medical diagnostics, especially in the area of patient-related rapid diagnostics, so-called point-of-care diagnostics and their use in the current COVID-19 crisis. By developing and upscaling new rapid diagnostic tests for SARS-CoV-2, the consortium aims to contribute to solving this crisis. A holistic approach is being pursued, which includes rapid diagnostic tests for acute infections as well as for immunity after a past infection. The aim is to develop systems for the point-of-care diagnosis of SARS-CoV-2 as well as the corresponding immune status and to manufacture more than one million tests per month in Europe. This high-throughput production is essential, especially for rapid diagnostic tests in times of a pandemic, so that a large number of tests can be used decentrally as diagnostic tools, e.g. by the family doctor, and provide test results quickly and efficiently.

For this purpose, the tests will be implemented in sensor platforms already commercialized by the project partners BiFlow® and GENSPEED® and the manufacturing processes of the required lab-on-a-foil systems will be scaled-up. The tests will be developed and manufactured in Europe and will therefore be available immediately for an acute crisis in the future.

"Through the collaboration of interdisciplinary competencies in NextGenMicrofluidics, we have the unique opportunity of optimizing manufacturing of our lab-on-a-chip technology platform," said Jörg Nestler, CEO, BiFlow Systems. He is confident that the further development of his technology platform for the direct detection of SARS-CoV-2 will contribute to the fight against the COVID-19 pandemic.

Max Sonnleitner, CEO of GENSPEED Biotech, spoke enthusiastically about the advantages of these novel production processes: "We will have available the lab-on-a-foil systems we need in large quantities at low prices. This will allow us to deliver large quantities of rapid antibody tests for SARS-CoV-2 quickly".

About NextGenMicrofluidics

The project combines the competences of 21 companies and research organizations along the entire value chain and offers services for the development and production of custom-

ized microfluidic lab-on-a-foil systems for companies - from start-ups to large industry. This includes a unique continuous roll-to-roll production line for high-throughput manufacturing of foil-based microfluidics.

The companies and research organizations forming the consortium are: JOANNEUM RESEARCH Forschungsgesellschaft mbH (coordination), BiFlow Systems GmbH, BioNanoNet Forschungsgesellschaft mbH, bionic surface technologies GmbH, Condensia Química S.A., Erba Technologies Austria GmbH, Fundación TECNALIA Research and Innovation, GENSPEED Biotech GmbH, ibidi GmbH, Biomedical Research Foundation of the Academy of Athens, Infineon Technologies Austria AG, Inmold A/S, Innovative Technologies in biological System, S.L., Micronit Microtechnologies B.V., micro resist technology - Gesellschaft für chemische Materialien spezieller Photoresistsysteme mbH, NATURSTOFF-TECHNIK GMBH, RESCOLL – Société de Recherche, SCIENION AG, University of Split, Technische Universität Graz and temicon GmbH

This project has received funding from the European Union's Horizon 2020 research and innovation program under Grant Agreement No. 862092 with a total volume of almost 15 million Euros for the next 4 years.

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NextGenMicrofluidics project has received funding from the European Union's HORIZON 2020 research and innovation programme under grant agreement n° 862092.

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Contribution of Materials Center Leoben Research GmbH

MCL is going SMART

Combining intelligent sensors and models for smart applications

Unexpected failures in electronic systems, machines or structural components can have far-reaching consequences. The resulting delays or failures in production cause high costs, maintenance work and often also loss of image.

At Materials Center Leoben Forschung GmbH (MCL), interdisciplinary research teams deal with failure detection in production and in the final products. For this purpose, innovative, low-cost sensor concepts are developed in combination with model-based condition monitoring expanding the area of application for failure detection. The topics range from materials science to the development of complex algorithms based on data from intelligent sensors and the application of data science.

Based on industrial use cases, the methods developed at MCL are put into practice, such as monitoring damage processes in LED modules (www.youtube.com) and milling metals.

In the production of highly integrated electronic systems such as LEDs, thousands of electrical interconnects have to be made quickly and reliably using various processes - and then the product has to withstand all external influences for as long as possible. Model-based condition monitoring can be used in production for 100% quality control as well as in the finished product for self-monitoring.

© Materials Center Leoben

Standard tests have only very limited information in terms of root-cause-analysis. Especially when designing new systems, product variants must be quickly tested for susceptibility to different types of errors.

Another use case is milling tools, which are exposed to enormous loads when manufacturing high-performance metallic components (e.g. turbine blades). A tool breakage during machining leads to production downtime and high material loss and thus to great losses in added value. Model-based condition monitoring can be used to identify unexpected damage at an early stage, document typical wear and tear regardless of the work piece being manufactured, and thus avoid plant downtimes.

Funding:

The Materials Center Leoben Forschung GmbH, as the host of the COMET-K2-Center IC-MPPE - "Integrated Computational Material, Process and Product Engineering", is part of COMET - "Competence Centers for Excellent Technologies" by the Austrian Federal Ministries of Climate Action, Environment, Energy, Mobility, Innovation and Technology (BMK) and for Digitization and Economic Affairs (BMDW), represented by the Austrian Research Promotion Agency (FFG), and the federal states of Styria, Upper Austria and Tyrol.

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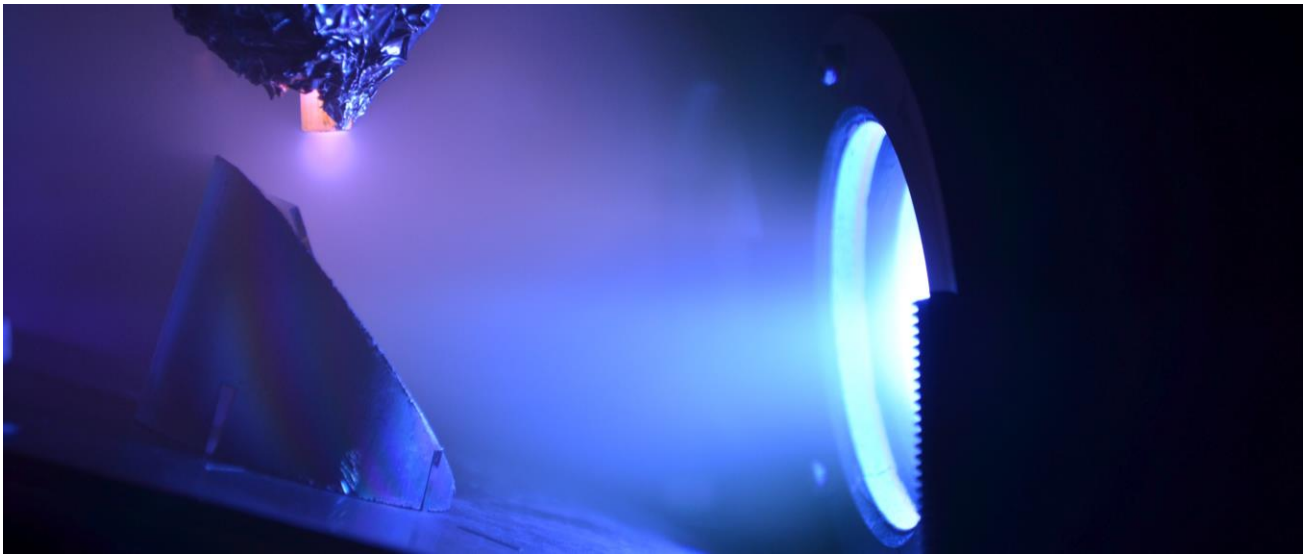
Contribution of PROFACTOR & MTC

INTERREG AT – CZ Project „NABIAM“

Network for Nanotechnology Biosensors and Additive Manufacturing

The project “NABIAM”, which started in April 2020 for a period of 12 months addresses the regions Upper Austria and South Bohemia. The project is a cooperation among Profactor GmbH, University of South Bohemia and the Plastics Cluster and the Medical Technology Cluster from Business Upper Austria.



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Plastics and medical technology are among the fields of strength in both Upper Austria and Southern Bohemia. In both regions there are experts in research, economy and start-ups in the fields of nanotechnology, biosensors and additive manufacturing. Together they could introduce innovations in medical technology to the market. However, the networking and cooperation potential can be expanded, as the actors are not sufficiently aware of the core competencies available in the regions. The existing know-how is not accessible without barriers and particularly innovative start-ups lack access to high-tech production and research equipment.

The aim of the NABIAM project is the establishment of a transnational network to make existing competences in the field of nanotechnology, biosensors and additive manufacturing visible. An additional goal is to encourage transnational cooperation and the progress of

new innovative developments in the field of medical engineering and other applications. To do so the NABIAM project consortium will investigate about research priorities and needs in the two regions and will visualize competences as well as R&D infrastructure within a technology roadmap and a competence map. In a second step an open innovation process will be carried out using innovative concepts like design thinking and matchmaking events to facilitate the knowledge transfer not only beyond regions but also from research to application. The implementation of the NABIAM network is a starting point. The project partners are interested to extend the currently involved regions of South Bohemia and Upper Austria to widen the network and facilitate even more cooperative projects between Austria and Czech Republic.

Co-financed by the European Regional Development Fond

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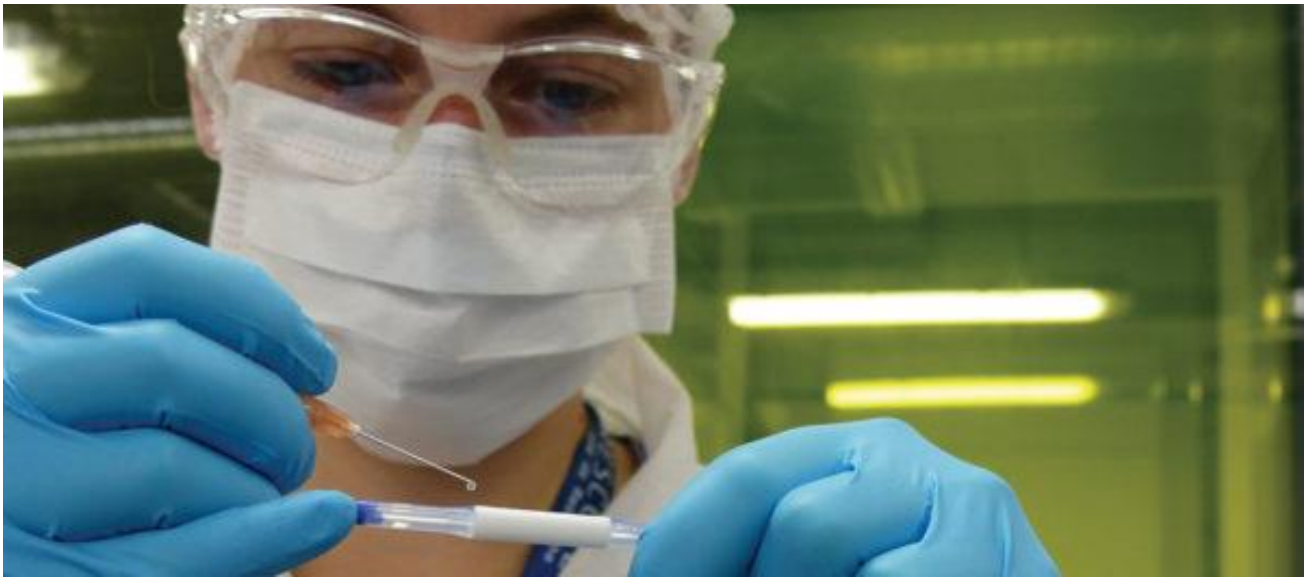
Contribution of RESCOLL

When innovation rhymes with collaboration



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RESCOLL is a French Research Company providing its customers with competitiveness by conducting innovation studies in the field of materials. Active on the European market for nearly 20 years now, RESCOLL specializes in analysis, expertise, and innovation of polymer, metal and composite biomaterials. With a team of over 100 doctors, engineers and technicians, RESCOLL is in charge or is involved in medical devices development for orthopedic, ophthalmic, cardiovascular, dental, intestinal implants sectors and skin compatible adhesives. RESCOLL has registered more than 50 patents in the field of polymers, adhesives, surface treatments and composites. Biomaterial and/or medical devices prototypes are performed using a variety of processing techniques traditionally used to manufacture products based on polymer, composite or also metallic materials. All experiment stages are conducted in accredited laboratories (COFRAC ISO 17025, ISO 9001 and ISO 13485).

RESCOLL has collaborated with the Danish company Biomodics and the Danish Technological Institute in the design of innovative Foley catheters. The work of this Franco-Danish consortium was carried out as part of the European project « DoseCath » financed by the Eurostars programme. The aim of DoseCath was to develop a new-generation Foley catheter with enhanced antibacterial properties.

RESCOLL brought to the consortium two of its core competencies that are bonding and coating formulation:

The company was involved in the selection of the right adhesive for the application, in order to determine a bonding process that can be transferred to industrial scale and carried out assembly validation tests (biocompatibility, mechanical strength, ageing in a physiological environment, etc.) in accordance with current standards.

RESCOLL also developed an antibacterial coating for the catheter tubing. The aim was to select suitable antibacterial agents for the application, and setting up a coating process that can be transferred to industrial scale and carry out all the validation tests.

RESCOLL had already developed a bioactive coating for use on metallic implants (dental implant) that is non cytotoxic and showed antibacterial activity (ISO 22196:2011, Laboratoire ICARE report n° 07384T-1P). This coating is based on silicon-based technology, which has great potential in applications where bioactive coatings are relevant, such as catheters. The coating is shown to be robust and functional. This coating is composed of an active material which is both biocompatible and abundant, and an excellent choice as an antibacterial agent as it promotes neither bacterial resistance nor bacterial proliferation.

RESCOLL is involved in many collaborative projects, with around six new European projects funded every year (NMBP, EUROSTARS…). The company is designed to bring complementary skills in materials to partners from TRLs 1 to 6.

For more information visit: www.eurostars-eureka.eu

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BNN *retrospect*

ESG ThinkTank: exploratory meeting material Innovations for medicine, technology and environmental protection

9th of March, 2020, Vienna, Austria

The ESG ThinkTank on March 9th, 2020 offered the opportunity to critically examine the topic of advanced materials and their contribution to a sustainable development of environment and society.

The following key questions were discussed with a panel of experts:

- „Funding programs – curse or blessing?“
- „How much freedom does science have left?“
- "What should a research landscape look like that enables productive and creative research in terms of sustainable development for the environment and society?”

Furthermore, the event was held back-2-back with a NanoSyn-networking and nanonet-AT-workshop, thus, strengthening the interaction within Austrian nano-community. The report was also supported by the NanoSyn-project team.

Download **REPORT on ESG ThinkTank**

supported by

Federal Ministry
Republic of Austria
Climate Action, Environment,
Energy, Mobility,
Innovation and Technology

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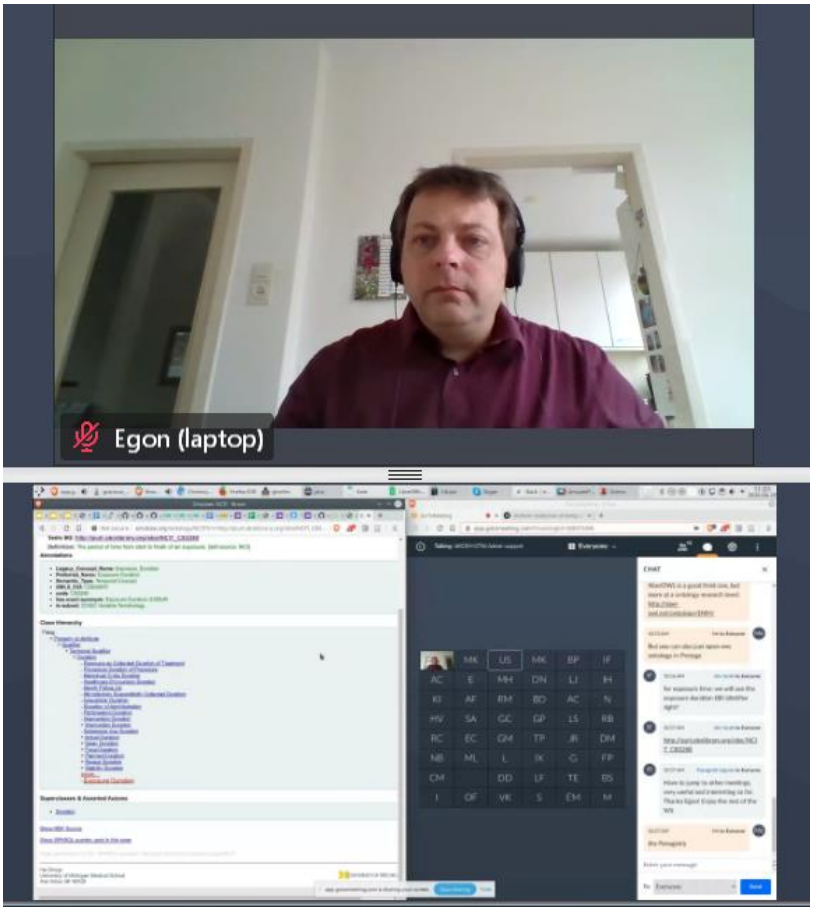
NanoCommons hackathon: annotating your experimental data workshop

28th of April 2020

On Tuesday, April 28th 2020, the EU H2020 NanoCommons project offered an online workshop on *data annotation* which was run by Egon Willighagen from Maastricht University, NL (http://orcid.org/0000-0001-7542-0286, Twitter: @egonwillighagen).



The NanoCommons FAIR data expert Egon Willighagen in his digital cockpit during the data annotation workshop

Under the title “Annotating Your Experimental Data Workshop” more than 50 registered participants learnt how to enrich their own (published) data by uploading to an online repository and thus enlarged the impact of their research. As can be seen in the figures below, partici-

pants were from a large number of different countries across Europe (and one person from Brazil) and included mostly early-stage researchers generating nanosafety data in the lab.

During the workshop, different issues were addressed, pursuing the aim to guide the participants through the process of learning how to annotate their own data in thus increasing data FAIRness in nanosciences.

During the morning session, and right after a short introduction to the NanoCommons project, the participants learnt to annotate a demo spreadsheet containing physicochemical characterization and bioassay data with ontology terms. After that, they were asked to translate what they did in the first session to annotate their own data spreadsheet with ontology terms.

The afternoon session began with a webinar about the importance of the FAIR principles, and the participants learnt how to make their own research “Findable”, uploading their (already published) datasets/articles in Figshare or Zenodo, under the guidance of Egon Willighagen, followed by the kick-off to large-scale data upload to online repositories in order to increase the database-annotated, and thus FAIRified data sets.

Egon Willighagen prepared a well-structured, interactive workshop including live polls; and there was enough time for Q&A of the participants.

Word cloud created by the participants reflecting their demographic profile

Link to the NSC NEWSLETTER

This project has received funding from the European Union’s Horizon 2020 research and innovation programme under the grant agreement n° 731032.

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NanoCommons hackathon: online Jaqpot hackathon

3rd of June 2020

On Wednesday, 3rd of June 2020, the EU H2020 NanoCommons project offered an online training session on the *Jaqpot suite of tools* which was run by the team of *Philip Doganis* from the *National Technical University of Athens, Greece*.

A screenshot taken during the training shows the NanoCommons Jaqpot expert Philip Doganis, ambitiously presenting and interacting with the participants during the Online Jaqpot Hackathon in COVID-19 times.

Under the subtitle **"Take your research from the bench to the community by making your models available as a web service"** more than 50 registered participants learnt how to use the Jaqpot suite and python to go from data to model, starting from a common CSV file and making their models available for others as a web service using Jaqpot.

To support scientists in creating a better impact with their research data was the implication of the Online Jaqpot Hackathon.

The webinar was attended by a heterogeneous public. Participants were from a significant number of different countries across Europe (and one person from Brazil and one from South Korea). The audience included some undergraduate students, mostly PhD candidates and postdoctoral fellows, and a few senior researchers including professors. There was a high share of academic affiliates, however, approximately 20% of attendees were employed at industrial stakeholder groups. The experience with *in silico* modelling of the majority of attendees (67%) was rather basic such as applying excel formats and most (75%) had not been using python before. There was a significant share of people working as experimentalists, however, also computationally advanced users were attending.

The hackathon was very interactive thanks to a really active audience and the use of parallel chats in virtual breakout rooms for private discussions between the participants facing challenges running the python notebooks at the hands-on session and the tutors from the team of *Philip Doganis* and *Harry Sarimveis* from *NTUA*. Thanks to the two *NTUA* tutors, *Irini Liampa* and *Pantelis Karatzas*, many issues people encountered could be solved in parallel videoconferencing in separate rooms, as such a type of hackathon with a heterogeneous audience is predestined that many individual questions may arise.

Running an interactive *in silico* training session with a large and heterogeneous audience turned out to be quite a challenge. Before the hackathon, participants reported on previous issues they had encountered when running models from other researchers. As challenges of available models, participants mainly mentioned the lack of accessibility/reusability/traceability to/of those models and this view was supplemented by the expectations the attendees brought with them when registering for the *NanoCommons Online Jaqpot Hackathon*.

The Jaqpot suite has been established to provide solutions for the above-mentioned problems as it provides users with the means to autonomously make their models available to the community as a web-based service. Jaqpot allows them to be shared to closed or open groups, reviewed, used by visitors of the model web page on their own data and commented in a discussion area. Hence, the teaching goal was to instruct users how they build models and create a web service for their model, a process which was conducted on an example during the NanoCommons hands-on training session.

In order to show users how this fits into the vision of NanoCommons, a number of topics were presented by NanoCommons experts. These topics included (i) an overview on the

NanoCommons initiative towards data FAIRness in nanosafety assessment with the project's goals being well in line with the training ambitions of the EU NanoSafety Cluster provided by *Martin Himly (PLUS)*; (ii) an introduction to and overview on the potentials (e.g. metadata completeness) in the use of electronic laboratory notebooks presented from the experimentalist's view point by the project coordinator *Iseult Lynch (UoB)*; and (iii) an introduction into the NanoCommons Knowledge Base as versatile data integration, tools, and information platform between data repositories for implementation of the FAIR goals given by *Dieter Maier (Biomax)*.

To wrap up the workshop, an evaluation form was circulated resulting in very positive feedback from the participants. Lessons learned will be implemented in the next training sessions that NanoCommons will organise in the next months; these will include further optimization when dealing with highly heterogeneous audiences. Very encouraging quotes from the feedback were that people wanted more on that, which provides a good instance to mention the possibility to apply for a Transnational Access for such type of *in silico* services available at: https://www.nanocommons.eu/ta-access/

The NanoCommons team will be happy to answer any questions and to guide you in your requests! Please approach us by email to helpdesk@nanocommons.eu. Transnational Access is running in times like this of course remotely. The offered spectrum of services spans the entire data life cycle including tools for experimental workflows, data processing and analysis, prediction and data storage.

Involved in this NanoCommons webinar were the BioNanoNet-members Allergy-Cancer-BioNano Research Centre of the University of Salzburg (PLUS), Unit of Process Control and Informatics - National Technical University of Athens (UPCI - NTUA) and BNN itself.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under the grant agreement n° 731032.

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BNN *conference calendar*

BNN events & BNN co-organised events

BNN Annual Forum & Networking Event

When? 17 September 2020, 14:00 *(start for non-BioNanoNet members)*

Where? Linz, TechCenter, Austria

Download AGENDA

For more details visit the BNN event website.

NanoNET Meeting

When? 18 September 2020, 9:00 – 13:00 CEST

Where? Linz, TechCenter, Austria

Save the date! More details and agenda coming soon.

4th EU-Asia Dialogue on Nanosafety

Asia Nano Forum and EU NanoSafety Cluster Event

When? 7 October 2020

Where? Vienna, Austria & web

This workshop is focused towards more synergy between Asian and European countries with respect to safe nanomaterials including standardisation and test guideline development. Two major themes will be addressed:

- The Malta Initiative, activities to speed up the process of updated or developing OECD test guidelines and guidance documents by gathering and developing the essential information that is needed for this process[1].

- In addition, this workshop will be on developing a call-for-proposals in which collaboration between EU and Asian countries is enabled. The aim of the meeting is to publish a report (joint paper) about the needs & missing points & common interests EU-US / EU-Asia and which research needs shall be addressed.

This follows the three previous EU-Asia Dialogue Events and a successful meeting last year in Boston, USA: “EU-US PRIORITIES IN NANOSAFETY IDENTIFIED DURING THE BILAT US 4.0 EVENT “FOSTERING EU-US COOPERATION IN NANOSAFETY”. The report will be sent to the EC and MS (e.g. via the EU-NSC and the program committee) as well as to the Asian countries (via ANF), OECD and to the EU-US BILAT colleagues. This shall enable the mentioned stakeholders to step forward towards joint funding of the areas of interest (e.g. joint calls, bilateral agreements on research collaboration, etc.). The format of the meeting is a mix of introduction, overview presentations and breakout sessions. - PRELIMINARY AGENDA

Registration is mandatory before September 21st 2020: Register here

If you have any questions, please contact the organisers (contact details, see agenda).

[1] *The Malta Initiative brings together a group of EU member states, the European Commission (notably the DG RTD, DG ENV, DG GROW and JRC), ECHA, industry and other institutions committed to this aim and welcomes additional international collaborators. In line also with existing procedures at the OECD, any country or organisation with expertise interested in working on adapting existing OECD TGs or developing new OECD TGs and/or GDs is welcome to become an active contributor to the “Malta Initiative”. See https://www.nanosafetycluster.eu/international-cooperation/the-malta-initiative/*

For more details visit the BNN event website.

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BNN participates

SmartNanoTox International Online Conference

When? 24 June 2020, 9:00 – 17:00 CEST

Where? Online meeting

The Conference will be organized along with SmartNanoTox project final online meeting.

The programme will include a detailed presentation of the SmartNanoTox project results, guest lectures, and round table discussions of the further steps in the development of mechanism-aware assessment of nanotoxicity.

UCD is BNN-member and Coordinator of SmartNanoTox Project.

Visit event website.

Immune response from occupational exposure to CNTs and nanofibers

When? 30 June 2020, 15:00 – 16:30 CEST

Where? Online meeting

CDC work on association of occupational exposure with ex vivo functional immune response in workers handling carbon nanotubes and nanofibers.

Speakers from the Centers for Disease Control and Prevention (CDC):

- Matthew Dahm – CNT/F exposure assessment
- Aaron Erdely – Occupational exposure and immune effects
- Mary K. Schubauer-Berigan – Cross-sectional evaluation of CNT/F workers

The study objective was to evaluate the association between carbon nanotube and nanofiber (CNT/F) exposure and ex vivo responses of whole blood challenged with secondary stimulants in a cross-sectional study of 102 workers.

Visit event website.

Medizinische Datenintelligenz: Datenlandschaft und Analysetools (online)

(in English: Medical data intelligence: data landscape and analysis tools)

When? 30 June 2020, 16:00 – 17:00 CEST

Where? Online meeting

The short presentations (in German) deal with the data situation in Austria, the technological possibilities to intelligently evaluate data (with insights into simulation, image-based artificial intelligence and visual data analysis) and the regulatory aspects in the healthcare system.

The event is free of charge. Registration is mandatory.

CLINAM 2020

When? 25 – 29 October 2020

Where? Basel, Switzerland

Clinical Nanomedicine and the Impact of Digitalization and Artificial Intelligence for Precision Medicine.

Visit event website.

NanoSAFE 2020 digital conference

When? 16 – 20 November 2020

Where? Online meeting

NanoSAFE conference is intended for sharing latest research results on health and safety issues related to nanomaterials and beyond for a socially responsible approach.

We would like to highlight the **NanoSafetyCluster-Meeting on 16th of November**!

Download AGENDA

Visit event website.

Due to the COVID-19-situation most of the upcoming events were and still will be cancelled and or postponed to a later date. BNN has continuously been updating the list of external events on our website. We invite you to take a look at our BNN website for all these events. (Note that BNN is not liable for the correctness, up-to-dateness and completeness of the data or contents). Please come back to us, if you find anything that needs to be updated. Thank you for your support.

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Finally

We hope you enjoyed our BNN NEWSLETTER!
Please do not hesitate to contact us if you would like to give us any suggestions or feedback!

Our next BNN NEWSLETTER will be published in September 2020.

BioNanoNet members are welcome to send their contributions until 10th of September 2020!

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