



03/2020

NEWSLETTER



Our vision

is to shape the European hightech ecosystem to secure a sustainable and prosperous society.

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Editorial

CONTEMPORARY ISSUES FROM THE NETWORK

Dear Ladies and Gentlemen,

the pandemic circumstances still influence all our daily business. We really hope that you are safe and healthy, and that you could relax during the summer season – maybe in a different way compared to other times.

This September was the first time having the BioNanoNet members meeting without physical presence of the participants, caused by the restrictions due to the Corona situation. However, we accepted this challenge and the BNN-team has set up a virtual [Annual Forum](#) on September 17th tailored to the core objectives of the association: to support scientific research and innovation by bringing together our partners, and by this initiating consortia for future joint projects.

Now, the [European Green Deal](#) Calls are already open, and several BioNanoNet members have started preparation efforts to answer those calls. Same is valid for the upcoming calls in [Horizon Europe](#). We actively contribute in the co-design process (e.g. participation in the R&I-Days, etc.) and based on the public information about destinations of the “clusters”, we already initiated in our community to actively think about project ideas. If you are

searching for excellent partners, you are welcome to contact the BNN-team to get connected.

A highlight of this autumn is definitely the launch of our new visual appearance. You already have in hands the newsletter in its new design, and you can find our [website](#) that shall bring you an easy-to-navigate opportunity to learn about the association, its members and the services provided by BNN.

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-Situation shows 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, get involved in our scientific and innovative work, and join the BioNanoNet association with your expertise, please [contact us](#).

Best regards,
Andreas Falk

BNN News

BNN HAS A NEW DESIGN

Due to BNN's new business structure (for more details please see [editorial](#)) we are now happy to present you our new corporate design and new website!

You can find the new website under the following address: www.bnn.at



Our members will also find a new [Members Area](#). If you need help, our [Help Center](#) gives you information about frequently asked questions. Your feedback is very important to us, as we strive to create a website that is valuable to you.

If you have any questions, comments or concerns, please don't hesitate to [contact us](#).

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BNN member presentations

ACSTYRIA MOBILITY CLUSTER



ACstyria represents a network of around 300 companies from the automotive, aerospace and rail systems sectors. The main purpose of the cluster – founded in 1995 – is the support of Styrian companies along the entire value-creation chain. It provides a link between business, industry, research and public institutions.

Shareholders: AVL List GmbH, Krenhof AG, KTM Industries AG, Magna Steyr, Steirische Wirtschaftsförderungsgesellschaft mbH, TCM International GmbH, voestalpine AG

AUTOMOTIVE

With more than 160 partner companies, the field of Automotive is the driving force of Styrian economy. The know-how ranges from the production and processing of raw materials and components through research & development to the production of complete vehicles.

AEROSPACE

More than 80 Styrian companies generate over 360 million € per year in the aerospace industry and employ around 1.500 employees. The main focus is on cabin interiors, structural components, powertrain, materials and lightweight construction.

RAIL SYSTEMS

With large system suppliers, highly qualified niche specialists and the world's leading research institutes, the Rail Competence Field is one of the most dynamic sectors in the industry. ACstyria supports partner companies in the areas of rolling stock, suspension and signaling.

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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 [website](#).

PERIOD JUNE – AUGUST 2020

CIBER-BBN

Sanz del Olmo N., Bajo A.M., Ionov M., García-Gallego S., Bryszewska M., Gómez R., Ortega, P. F., de la Mata, J. (2020): Cyclopentadienyl ruthenium(II) carbosilane metallodendrimers as a promising treatment against advanced prostate cancer. European Journal of Medicinal Chemistry, Volume 199, 112414, ISSN 0223-5234, <https://doi.org/10.1016/j.ejmech.2020.112414>

Natalia Sanz del Olmo, Ana M. Bajo, Maksim Ionov, Sandra García-Gallego, Maria Bryszewska, Rafael Gómez, Paula Ortega, F. Javier de la Mata. (2020): Cyclopentadienyl ruthenium(II) carbosilane metallodendrimers as a promising treatment against advanced prostate cancer. European Journal of Medicinal Chemistry, Volume 199, 112414, ISSN 0223-5234, <https://doi.org/10.1016/j.ejmech.2020.112414>

Camarero N., Trapero A., Pérez-Jiménez A., Macia E., Gomila-Juaneda A., Martín-Quirós A., Nevola L., Llobet A., Llebaria A., Hernando J., Giralt E., Gorostiza P. (2020): Photoswitchable dynasore analogs to control endocytosis with light. Chem. Sci.

Pérez del Río, E., Santos F., Rodriguez X., Martinez Miguel M., Roca Pinilla, R., Arís A., Garcia-Fruitós E., Veciana J., Spatz J.P., Ratera I., Guasch J. CCL21-loaded hydrogels for T cell expansion and differentiation. Biomaterials, DOI: 10.1016/j.biomaterials.2020.120313

Molina N., González A., Monopoli D., Mentado B., Becerra J., Santos Ruiz J., Vida Y., Pérez E., (2020): Inestrosa. 'Dendritic Scaffold onto Titanium Implants. A Versatile Strategy Increasing Bio-compatibility'. Polymers. <https://doi.org/10.3390/polym12040770>

Moreno, VM; Alvarez, E; Izquierdo-Barba, I; Baeza, A; Serrano-Lopez, J; Vallet-Regi, M. Bacteria as Nanoparticles Carrier for Enhancing Penetration in a Tumoral Matrix Model (2020). ADVANCED MATERIALS INTERFACES Vol 7, Issue11. Article Number: 1901942. DOI: 10.1002/admi.201901942

Hahn-Schickard

Rombach, K., Hin, S., Specht, M., Johannsen, B., Lüddecke, J., Paust, N., Zengerle, R., Roux, L., Sutcliffe, T., Peham, J.R., Herz, C., Panning, M., Donoso Mantke, O., Mitsakakis, K. (2020): Re-spiDisk: a Point-of-Care platform for fully automated detection of respiratory tract infection pathogens in clinical samples. Analyst, DOI: 10.1039/d0an01226b.

ICCRAM, University of Burgos

Laguna-Teno, F., Suarez-Diez, M., Antonio Tamayo-Ramosm J. (11 August 2020). Commonalities and Differences in the Transcriptional Response of the Model Fungus *Saccharomyces cerevisiae* to Different Commercial Graphene Oxide Materials. Front. Microbiol., <https://doi.org/10.3389/fmicb.2020.01943>

RECENT

Qin, J., Zhang, M., Guan, Y., Li, C., Ma, X., Rankl, C., & Tang, J. (2020). Investigation of the interaction between MeCP2 methyl-CpG binding domain and methylated DNA by single molecule force spectroscopy. Analytica Chimica Acta, 1124, 52–59. <https://doi.org/10.1016/j.aca.2020.05.029>

Zorin, I., Su, R., Heise, B., Lendl, B. and Brandstetter, M. (2020). Correlative infrared optical coherence tomography and hyperspectral chemical imaging, J. Opt. Soc. Am. A 37, B19-B26 <https://www.osapublishing.org/josaa/abstract.cfm?uri=josaa-37-9-B19>

Zorin I, Kilgus J, Duswald K, Lendl B, Heise B, Brandstetter M. (2020). Sensitivity-Enhanced Fourier Transform Mid-Infrared Spectroscopy Using a Supercontinuum Laser Source. Appl Spectrosc.; 74(4):485-493. doi:10.1177/0003702819893364

Project presentations

NANOPAT

Process Analytical Technologies for Industrial Nanoparticle Production



NanoPAT is the acronym for “Process Analytical Technologies for Industrial Nanoparticle Production”, a research project funded in the frame of EU Horizon 2020 research and innovation programme. It is one of the six projects that have been funded under the NMBP-08 call (DT-NMBP-08-2019 - Real-time nano-characterisation technologies (RIA)): NanoPAT, CHALLENGES, RealNano, PAT4Nano, NanoBat, NanoQI.

While bulk materials have constant physical properties independent of their size, the physical and chemical properties of a nanopartic-

le are dictated by its size. Accurate characterization of mean size, size distribution and shape is key to the efficient manufacturing of high-quality nanomaterials. The EU-funded NanoPAT project plans to use three new real-time analytical tools that overcome problems and limitations of conventional characterization technologies. The new process analytical technologies (PAT) will be photon density wave spectroscopy, optofluidic force induction and turbidity spectrometry. The innovative technologies will be combined with new data analysis methods to provide, for the first time,

real-time analysis of particles on the nanometre scale with sub-minute temporal resolution.

The partners of this project, which has a duration of 48 months (June 2020 – May 2024), come from academia, industries (SMEs and large industry) and research organizations in 8 European countries, bringing together solid scientific knowhow in the relevant fields and strong industrial and commercial involvement to ensure that the value chain of commercial actions can progress swiftly towards the introduction of new real-time solutions for the monitoring of nanoparticle production processes.

In June 2020 (4th and 5th) the partners of NanoPAT project met (virtually), successfully kicking-off the project. The project coordinator is Simona Neri from IRIS Technology Solutions S.L. (Spain). Besides [BNN](#), the BioNanoNet-members [MUG](#), TEMAS and [ZHAW](#) are beneficiaries in NanoPAT.

BNN is responsible of the training, communication and dissemination management of NanoPAT'S results and activities.

Get connected with NanoPAT on:



[SEE WEBSITE](#)



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 862583.

SBD4NANO

Computing infrastructure for the definition, performance testing and implementation of safe-by-design approaches in nanotechnology supply chains



SbD4Nano is a research project funded in the frame of EU Horizon 2020 research and innovation program with the full title “Computing infrastructure for the definition, performance testing and implementation of safe-by-design approaches in nanotechnology supply chains”. It is one of four projects that have been funded under the NMBP-15-2019 call. The project started on 1st of April 2020 and will last until 31st of March 2024 (48 months). 23 partners participate in SbD4Nano project.

A major challenge for the global nanotechnology sector is the development of safe and functional engineered nanomaterials (ENMs) and nano-enabled products (NEPs). In this

context, the application of the Safe-by-Design (SbD) concept has been adopted recently by the nanosafety community as a means to dampen human health and environmental risks, applying preventive safety measures during the design stage of a facility, process, material or product. However, and despite its importance, SbD prescriptions are still in their infancy, and are hampered among other things by the lack of comprehensive data about the performance, hazard and release potential of the great variety of NEPs in use.

SbD4Nano addresses that problem creating a comprehensive new e-infrastructure to foster dialogue and collaboration between all actors

in the supply chain for a knowledge-driven definition of SbD setups that optimize hazard, technical performance and economic costs. Our project develops a validated rapid hazard profiling module, coupled to a new exposure-driven modelling framework to reduce toxicity. This safe-born material also undergoes a cost-benefit analysis algorithm to find the best compromise between safety and a industrially convenient technical performance. Finally, a new software interface where product information can be exchanged between the supply chain participants is the tool that wraps up, finishing the collaborative spirit of

SbD4Nano between regulators, researchers and industry. Coherently with its goals, the SbD4Nano project uses an international multidisciplinary approach and promotes open science, with the clear aim of impacting the EU policies as well as directly and clearly benefiting the citizens.

BNN's role in this project is to lead all activities related to stakeholder engagement, as well as dissemination and exploitation of project results.

Get connected with SbD4Nano on:



[SEE WEBSITE](#)

SbD4Nano project has received funding from the European Union's HORIZON 2020 research and innovation program under grant agreement n°862195.

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SINFONIA

Safety in NanOMaterials & NANotechnology



SiNfONiA is a research project funded in the frame of EU Horizon 2020 research and innovation program with the full title “Safety in NanOMaterials & Nanotechnology. The project started on 1st of June 2019 and will last until 31st of May 2024 (60 months).

Nanotechnology, which involves moleculesized machines and processes, can help save precious resources and minimise wastage. The term nano (Greek for ,dwarf’) means one billionth and a nanometre is a billionth of a metre (a strand of hair is about 75 000 nanometres across). The EU-funded SiNfONiA project aims to ensure the safe development and application of this emerging, cutting-edge technology in diverse areas such as medicine, environment and energy production. At the International Iberian Nanotechnology Laboratory in Portugal, the project will attract

and maintain a high-profile researcher (ERA Chair) and a team with excellent research capabilities in the nano-safety research domain.

Andreas Falk, BNN, is member of the International Advisory Board of SiNfONiA project.



SiNfONiA project has received funding from the European Union’s HORIZON 2020 research and innovation program under grant agreement n° 857253.

[SEE WEBSITE](#)

SIXTHSENSE EU PROJECT KICKED OFF

Lifesaving technology for those charged with saving lives



The European Project SIXTHSENSE on health monitoring with sensory feedback for enhanced situational awareness was launched in Donostia-San Sebastián on May 19 – 20, 2020

On May 19th and 20th, the kick-off meeting of the EU-funded project SIXTHSENSE – “Smart Integrated eXtreme environmenT Health monitor with Sensory feedback for ENhanced Situation awarEness” took place in the virtual space shared between nine participating countries. The project is a multidisciplinary innovation and research action with the overall aim of developing a wearable health monitoring system with closed loop tactile biofeed-

back, that allows first responders in hazardous situations to sense their current health status. It will allow early detection of risk factors that could lead to rapid deterioration of health or operation capabilities of first responders, by leveraging predictive models based on multi-modal biosensor data (e.g., lactate, Na, K, HR, temperature). As a team management tool, it will enable real-time monitoring of all deployed operatives, helping increase team effectiveness and operational safety.

To help accelerate the pace of technological advancements aimed at first responders, beyond the scope of the project, SIXTHSENSE will establish a novel research methodology

for sustainable inclusion of first responders in a co-development process.

SIXTHSENSE is funded withing the EU Horizon 2020 program as a 36 months project, with the over-all funding of €7.242.442,5. The project consortium comprises 21 organizations from nine European countries, coordinated by TECNALIA Research & Innovation (Spain). The project consortium comprises three universities: Aalborg Universitet (Denmark), Universidad de León (Spain) and Technische Universitaet Chemnitz (Germany); five European Research and Technology Organizations: TECNALIA (Spain), JOANNEUM RESEARCH Forschungsgesellschaft mbH (Austria), BioNanoNet Forschungsgesellschaft (BNN) (Austria), Eucentre Foundation (Italy) and Tecnalia Serbia (Serbia); two large industry representatives: Jobst Technologies (Germany) and Methrom DropSens (Spain); and five SME partners: Senetics healthcare group (Germany), TeleGroup (Germany), Smartex (Italy), Global Electronic Solutions (Serbia), BiFlow Systems (Germany) with different areas of expertise. The project also counts active participation from first responders organizations, as Serbian Mountain Rescue Service, Association of Mountain Rescue Organizations of B&H and four fire fighter companies with different profiles from Gumpoldskirchen (Austria), Postojna (Slovenia), Rijeka (Croatia) and Pavia (Italy), and a fire rescue training and risk management experts - IFR (Austria).

Role of JOANNEUM RESEARCH Forschungsgesellschaft mbH – Institute DIGITAL

The contribution of the Institute DIGITAL bu-

ilds upon the developments and experiences in the area of first responder decision support and human factors research. DIGITAL's "Cognitive Sensing and Interaction Group" led by Lucas Paletta will first investigate stressful scenarios that decline situation awareness in critical decision making being supported by Prof. Wolfgang Kallus (Institut für Begleitforschung). Data from wearable biosensors and mobile eye tracking will be collected in comprehensive field tests in order to estimate the status of human physical and cognitive readiness and provide AI-enabled recommendations for risk minimization. The "Mobile Computing Group" led by Patrick Luley with its expertise on real-time data communication will focus on the development of innovative mobile decision support for the firefighters.

Role of JOANNEUM RESEARCH Forschungsgesellschaft mbH – Institute MATERIALS

The Institute MATERIALS supports the development of the minimally invasive biosensors for first responders by means of computer-aided fluidic simulations. These finite element-based tools will be used to simulate the transport of respective body fluids in the microfluidic components of the biosensors and will give valuable input for design and layout optimizations of the sensors.

Role of BNN

As task leader for 'safety' BNN will contribute to the WP 'co-development, safety and experimental deployment'. In addition, safety evaluation will be performed in collaboration with

the relevant practitioner groups throughout the development cycle (e.g. safety evaluation of bioinks, etc.). With its profound experience, BNN will also contribute in coordination & management, as well as in dissemination, exploitation & communication activities.

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Project Coordinator:

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International Business

Development Manager

TECNALIA RESEARCH & INNOVATION

(SPAIN)

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BioNanoNet Forschungsgesellschaft mbH

(AUSTRIA)

[SEE WEBSITE](#)



This project has received funding from the European Union's Horizon 2020 research and innovation program under grant agreement No 883315.

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Project updates

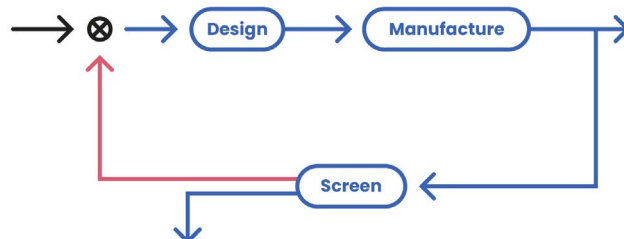
SABYDOMA

SAfety BY Design Of nanoMAterials – From inspiring ideas to real project outcomes



Philosophy – Together with the increasing use of nanomaterials, an increasing concern for its safety aspects has arisen. Out of this concern has developed the paradigm of Safety-by-Design (SbD). This phrase has been associated with many approaches from drug design analogies to iterative nano legislature and these ideas have been discussed very openly. In many funded Case Studies, SbD has been represented as a sophisticated form of health and safety management. It is no surprise therefore that there has been some confusion as to what SbD really means and how it relates in exact terms to nanosafety. SABYDOMA intends to clarify the meaning of SbD and provide a quantum advance in the development

of the SbD approach. In fact, SABYDOMA sees SbD as a control system issue. In this, the design of nanomaterials is moderated continuously by rapid screening at the point of production and feeding the screen results back to the design. This general concept on which the whole SABYDOMA project is based, is represented beneath. Note that the production-line is in blue and the feedback signal is in red.



Ideas – These were initially developed to solve issues of environmental pollution and climate change. For example, when a pollutant is discharged into a river and the river is continuously monitored for that pollutant, any increase in river pollutant level above a “safe” level is recorded and fed back to the discharge source where the pollutant discharge is continuously moderated. Sabydoma works through evidenced based decisions (EbD), which operate vectorially on a technological platform. Sabydoma is an outcome of the technology developed in the EU H2020 HISENTS project, which built a high-throughput flow through platform for screening nanomaterials using multiple sensor elements. Accordingly, Sabydoma aims to develop a Lead Demonstrator which will be used for the flow-through production of safe nano.

Objectives – Sabydoma’s main objective is to develop a new methodology to address the SbD challenge as a Control System Problem. Its technological solution is coupling screening to design. Sabydoma will use system control and optimization theory including the Model Predictive Control (MPC) philosophy, binding SbD from laboratory innovation to the industrial production line and from decision making processes to project governance. Figure 1 shows how the HISENTS biomembrane sensor is coupled to a nano production-line. In this way, the safety of the nanomaterial produced is controlled by nano-capping in response to screen signal. Figure 2 shows the high-level Lead Demonstrator on which the whole project is based.

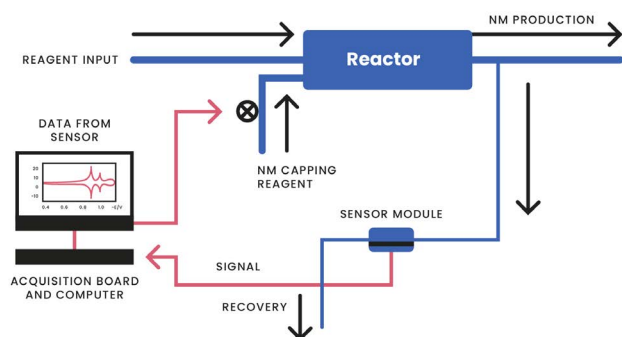


Fig 1: Biomembrane sensing technology coupled to flow through NM production

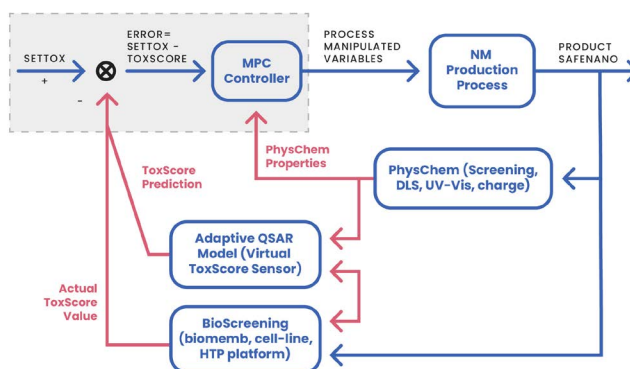


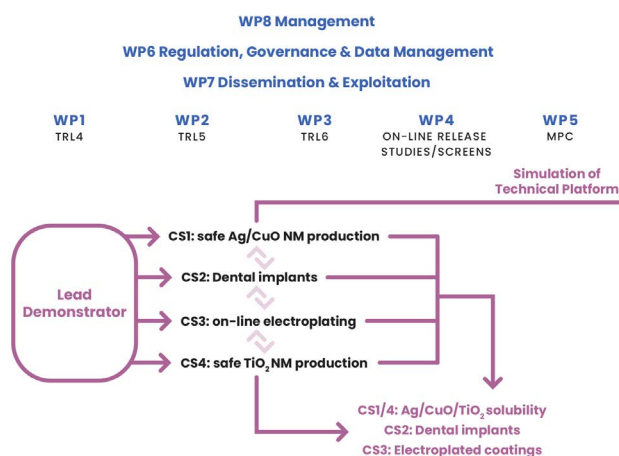
Fig 2: Application of systems control to SbD in nano-materials

Summary – SABYDOMA addresses developments in the safety by design (SbD) paradigm by examining 4 industrial case studies in detail where the Technology Readiness Levels (TRLs) will advance from 4 to 6. Each TRL activity progresses from being lab based at TRL4 to being industry based at TRL6. The TRL4 activity involves only innovation with regular industrial communication whereas the TRL6 activity involves industrially located activities with innovation communication. Figure 4 shows how the whole of the SABYDOMA thrust is configured working through 4 unique Case Studies hosted by 4 companies respectively working closely with lawyers, regulators and experts in governance.

Outcome – 2 of the Case studies involve the manufacture of nanomaterials and thus will develop the Lead Demonstrator. The other 2 Case Studies will deal with the manufacture of specialized coatings which will be subject to rigorous release studies and screening of leachate. A mini-release accelerator will be deve-

loped and used to screen the release leachate and the screening results will be fed back to moderate the coating manufacture. The final focused SbD outcome will be the 4 demonstrators developed by the 4 companies respectively.

SABYDOMA has 19 partners, 15 partners are from the EU and the project is coordinated by University of Leeds. It began on 1 April 2020 and runs to end September 2023. Total funding €6 mil.



Get connected with SABYDOMA on:



[SEE WEBSITE](#)



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

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BNN Member Contributions

AUSTRIAN CENTRE OF INDUSTRIAL BIOTECHNOLOGY
(ACIB) – INNOVATIONS FROM NATURE



Contribution from ACIB

The Austrian Centre of Industrial Biotechnology (acib) is an international competence center, developing new, environmentally friendly, economically and technically advanced processes for the biotechnological, pharmaceutical and chemical industry – all of them modelled on nature. Currently, more than 250 acib scientists are working on more than 150 industrial and strategic projects. This know-how is the foundation for new and improved applications and products in nearly all fields of life sciences all over the world, e.g. agriculture, environment and nature, food and feed, materials, pharma and cosmetics and health.

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AILANI - YOUR SCIENTIFIC ASSISTANT FOR HELPING YOU TO GAIN A DEEPER UNDERSTANDING



Contribution from Biomax



Get a deeper insight in your knowledge

AILANI is a novel and unique semantic search solution for fast, easy and comprehensive knowledge discovery. It combines semantic modelling, ontologies, linguistics and artificial intelligence (AI) algorithms and delivers the most relevant results and puts them in a wider context for deeper analysis. Queries can

be expressed in natural language and AILANI will provide you with relevant answers regardless of the quality of your search term. AILANI stands for Artificial Intelligence LAN-guage Interface and in research enables you to (i) raise the productivity of your scientists and (ii) to make better decisions by integrating public and proprietary knowledge.

How does AILANI work?

AILANI integrates a variety of resources: from in-house documents and proprietary libraries to experiments, sequences and clinical data, to any public data resource or newsfeed (Figure 1). It can seamlessly be connected with existing in-house infrastructures to help better leverage the tacit knowledge that is hidden in the data. By integrating these resources - from decades-old data to the latest free-form text news streams – AILANI enables real-time semantic analysis of breaking news with respect to specific customer data and information sources. Furthermore, AILANI extracts chemical information from scanned documents by applying optical character recognition (OCR) and optical structure recognition (OSR).

Based on the semantic core technology of Biomax, AILANI provides an extensible search framework that automatically maintains a

growing and evolving semantic network. This “meta-ontology” supplements and extends more than 60 life science ontologies that are automatically updated and can be extended with any additional public or proprietary ontology.

To facilitate searches and allow focused exploration in different research domains AILANI comes in different flavors (AILANI for pharma & biotech, nutrition and agritechology), by providing for instance domain specific filtering options and example questions. Recently we made AILANI COVID-19 (<https://ailani.ai>) publicly available to enable users to explore and analyze the rapidly growing set of advances in COVID-19/SARS-CoV-2 research as they accumulate in real time and integrate them with structured information on human and viral biology. The growing literature content is continuously mined and AILANI

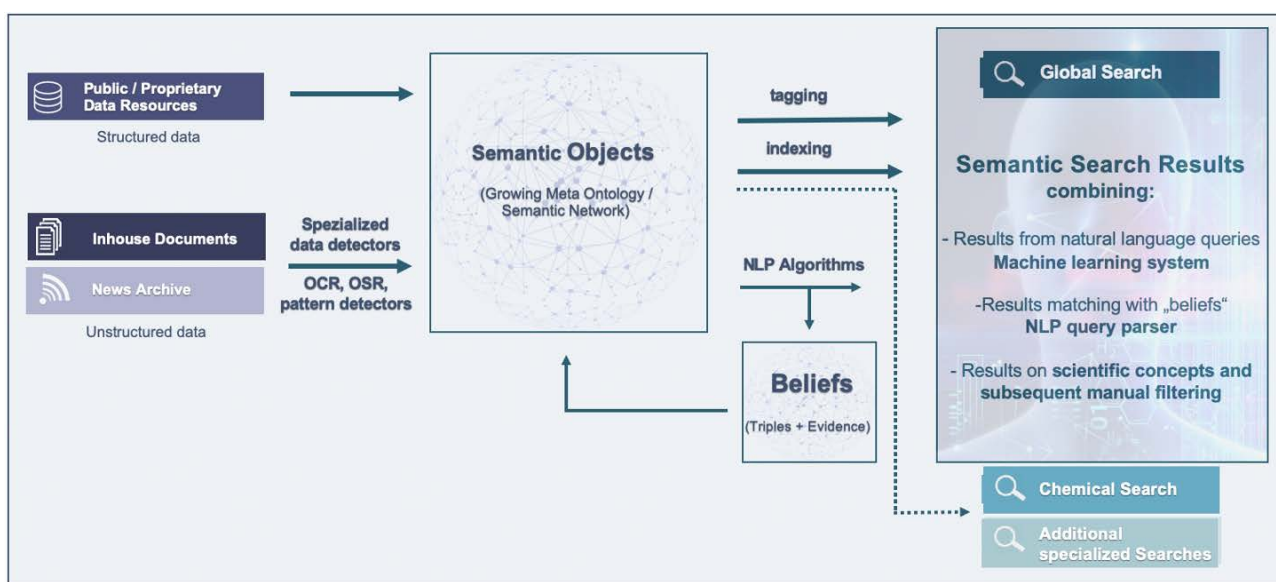


Fig 1: AILANI workflow

COVID-19 answers natural language questions such as „What are COVID-19 risk factors?“ with AI assessed relevant answers as well as a graphical summarization of all responses that enables interactive ontology based exploration and refinement. Smart Breadcrumbs monitor each step of the interactive user journey and allow to track back or jump to previous stages. For registered users these smart breadcrumbs are automatically saved as your search history and can be used to subscribe to alerts. In summary, AILANI is a search engine that helps users to quickly and efficiently find answers to various questions, gain in depth background knowledge and accelerate innovation in a very short time.

Contact:

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About Biomax

Biomax Informatics provides computational solutions for better decision making and knowledge management in the life sciences. The solutions help customers generate value by integrating information from proprietary and public resources to enable a knowledge-based approach to developing innovative life science products. Biomax's worldwide customer community includes clinics, companies and research organizations with a focus on drug discovery, diagnostics, fine chemicals, food and plant production. Founded in 1997, with 45 employees the company is ISO 9001 and ISO 27001 certified and headquartered in Planegg near Munich.

For further information please visit
www.biomax.com.

CIBER-BBN AND NANBIOSIS-ICTS KEEPS WORKING ON SAFE-N-MEDTECH



Contribution from CIBER-BBN



Two-day meeting between representatives of NANBIOSIS units, at the Jesús Usón Minimum Invasive Surgery Center (CCMIJU), in Cáceres, to plan the work to be done in the coming months and carry out some tests within the framework of the European project Safe-N-MedTech (10 - 12 March 2020).

CIBER-BBN participates as a partner in the Safe-N-Medtech project through its Scientific Infrastructure, the ICTS NANBIOSIS. Several units of NANBIOSIS from CIBER-BBN and JUMISC will carry out some of the F/Q, in vivo and in vitro characterizations applied to pilot test cases developed inside the project and NANBIOSIS will work on the leadership of WP3

Preclinical Research in nano-enabled MTs Specifically, NANBIOSIS is actively involved with the four Test Case Developers: Stryker Trauma GmbH, Resonant Circuits Elements, A.L., HELIA Biomonitoring and TECNAN.

The Safe-N-MedTech European Project kicks off in May last year in Bilbao (Basque Country)

to create an open innovation platform with the aim of accelerating the development of medical devices based on nanotechnologies. The new project is part of the Open Innovation Test Bed initiative (OITB) launched by the European Commission with the aim of accelerating the development of medical devices based on nanotechnologies in Europe and abroad.

The initiative aims to build an open innovation platform to offer companies and reference laboratories the capabilities, knowledge, networks and services necessary for the development, testing, evaluation, improvement and exploitation of the market of medical devices and diagnostic based in nanotechnology. This

platform will offer a multidisciplinary and market-oriented innovation approach for SMEs, health care providers and industries, accelerating the transfer to the market of these new medical devices. During the first years of project work, the partners will develop their services and test them in different case studies, so that, Safe-N-Medtech OITB can become a sustainable and competitive services platform for companies to accelerate their developments according to the necessary regulatory requirements and ensure the safety and effectiveness of their medical devices based on nanotechnologies.

Contact:

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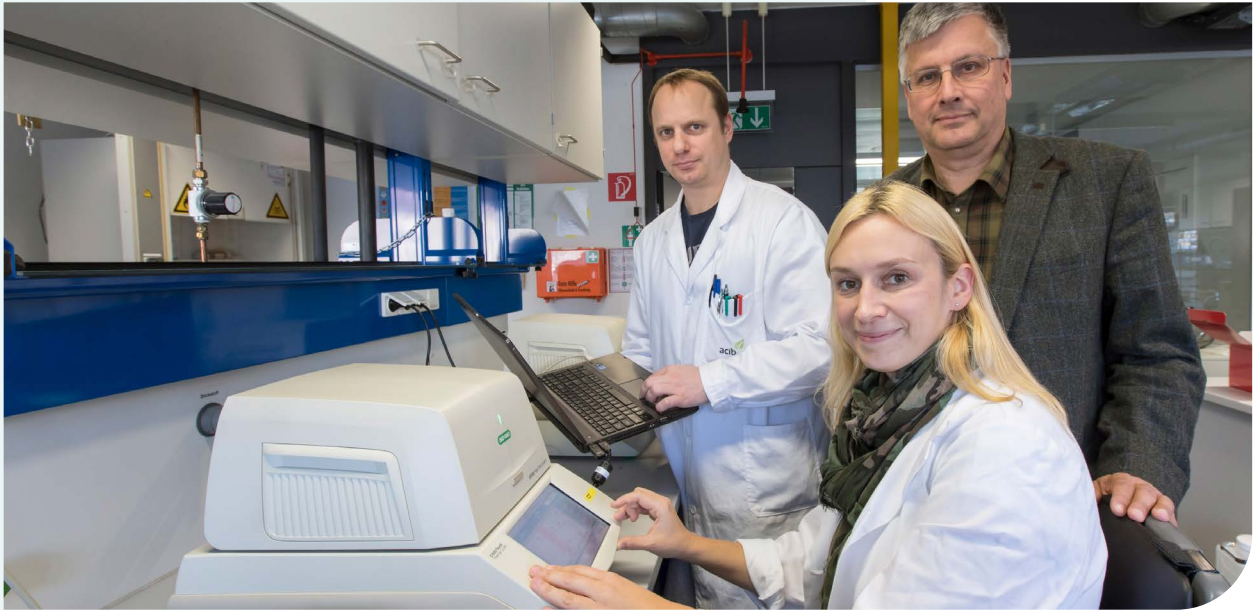
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www.nanbiosis.es

MILESTONE FOR THE EARLY DETECTION OF SEPSIS



Contribution from Graz University of Technology



A team led by Christoph W. Sensen (right), head of the Institute of Computational Biotechnology at TU Graz, has succeeded in using biomarkers to diagnose sepsis 2 to 3 days before the first clinical symptoms appear. © Lunghammer - TU Graz

Researchers from Graz, Austria, are developing a ground-breaking method that uses biomarkers to detect sepsis 2 to 3 days before the first clinical symptoms appear. This can significantly increase the chances of survival in cases of blood poisoning by bacteria or fungi.

Whether activating or silencing genes, breaking down defective cells or building new tissue, our body is constantly working to repair

itself, even in cases of illness. To fight a disease, our body sends out signals, often long before we ourselves notice the disease. Such signals are, for example, DNA molecules that are released from the body's own cells, circulate in the blood and are most likely recognized by other cells as a message to stimulate a defence reaction.

Researchers at TU Graz's Institute of Computational Biotechnology have identified mes-

sengers and together with scientists from the Austrian Centre of Industrial Biotechnology (acib), the Medical University of Graz and CNA Diagnostics GmbH (Grambach, Styria), have developed a ground-breaking method: using these endogenous signals (biomarkers), sepsis can be diagnosed with high accuracy two to three days before the first clinical symptoms occur. The test based on this method could significantly increase the chance of survival of sepsis patients and lower the negative side effects for sepsis survivors. The researchers have now published details on this in the two papers [„Evaluation of host-based molecular markers for the early detection of human sepsis“](#) and [„Circulating cell-free DNA is predominantly composed of retrotransposable elements and non-telomeric satellite DNA“](#) in Journal of Biotechnology (Elsevier).

Classification algorithms serve as a basis

„Our team has identified 24 biomarkers with which bacterial- or fungal-induced sepsis can be detected at an earlier stage when compared to the currently used tests, using classification newly developed algorithms,“ explains Christoph W. Sensen, head of the Institute of Computational Biotechnology at TU Graz.

For their work, the bioinformaticians used sequencing data derived from anonymized plasma samples provided by the research groups led by Robert Krause, co-director of BioTech-Med-Graz, and Peter Neumeister at the Medical University of Graz. The samples came from persons diagnosed with sepsis caused by bacteria or fungi, respectively, (in whose blood these pathogens were detected), influenza (a

disease with symptoms partly similar to sepsis) or lymphoma, as well as from healthy individuals. The sequencing data formed the basis for the development of the algorithms that were used to identify the markers, thus creating an unprecedented set of markers. „This data set can be used to distinguish people in the early stages of sepsis and those with early clinical signs from healthy people and from people with other diseases.“ Sensen continues: „Within the patient group for which the markers were developed, the diagnostic accuracy was almost 90 percent in the period from two days before the first clinical signs until two days after diagnosis with the currently used diagnostic methods. In blind studies with patient groups that were not included in the marker development, the accuracy was still up to 81 percent.“ With the help of this method, sepsis can therefore be diagnosed much earlier than with any other diagnostic method.

Host-based test procedure, approval procedure already underway

In the course of their studies, the researchers also developed a new form of quantitative real-time PCR test. PCR stands for Polymerase Chain Reaction, a method for amplifying nucleic acids. PCR-based tests are already in use in clinics, for example for the detection of the COVID-19 virus in patients. These kind of tests are often used to amplify the DNA or RNA of an infectious agent in a blood, plasma or serum sample, e.g. allowing the direct detection of bacteria or fungi in sepsis patients. In view of the large number of possible pathogen species which might cause sepsis however, this is

only possible to a very limited extent for sepsis patients and is therefore very imprecise. The newly developed test of the Graz group, on the other hand, focuses on the body's own signals, which are representative for the onset of sepsis for all bacterial and fungal cases. These can therefore be measured with much higher accuracy and also 2-3 days earlier than the direct detection of pathogens would allow.

Approval in the United States at the U.S. Food and Drug Administration (FDA) in Washington has already been applied for via the 510k approval process and the clinical trial has begun. The work for approval in Europe is just starting. Christoph W. Sensen hopes that the tests will soon be used on a large scale. „However, the corona pandemic is putting our timetable somewhat on the back burner, as US hospitals will of course not be able to supply plasma samples for some time due to the current situation.“ Bernd Nidetzky, CSO of the Austrian Centre of Industrial Biotechnology (acib), comments: „The development of fast and efficient diagnostic procedures, such as the method for early detection of sepsis presented

here, is a new field within acib, which we are establishing in the current funding phase of our competence center. We are delighted that this work has reached the clinical trial phase so quickly!“

Further plasma samples sought

In the meantime, data from China shows that even COVID-19 patients with severe end-stage disease often had sepsis as a secondary disease. Sensen and his team are all the more interested in cooperating with biobanks such as BBMRI-ERIC and hospitals that are able to provide the team in Graz with plasma samples from COVID-19 patients. Because, according to Sensen: “On the basis of the sepsis early-detection research program, we should be able to develop diagnostic tools for the faster identification of high-risk patients and a strategy for early intervention at the first signs of sepsis, which can be used in future pandemics to reduce the consequences of the infection for those affected.“

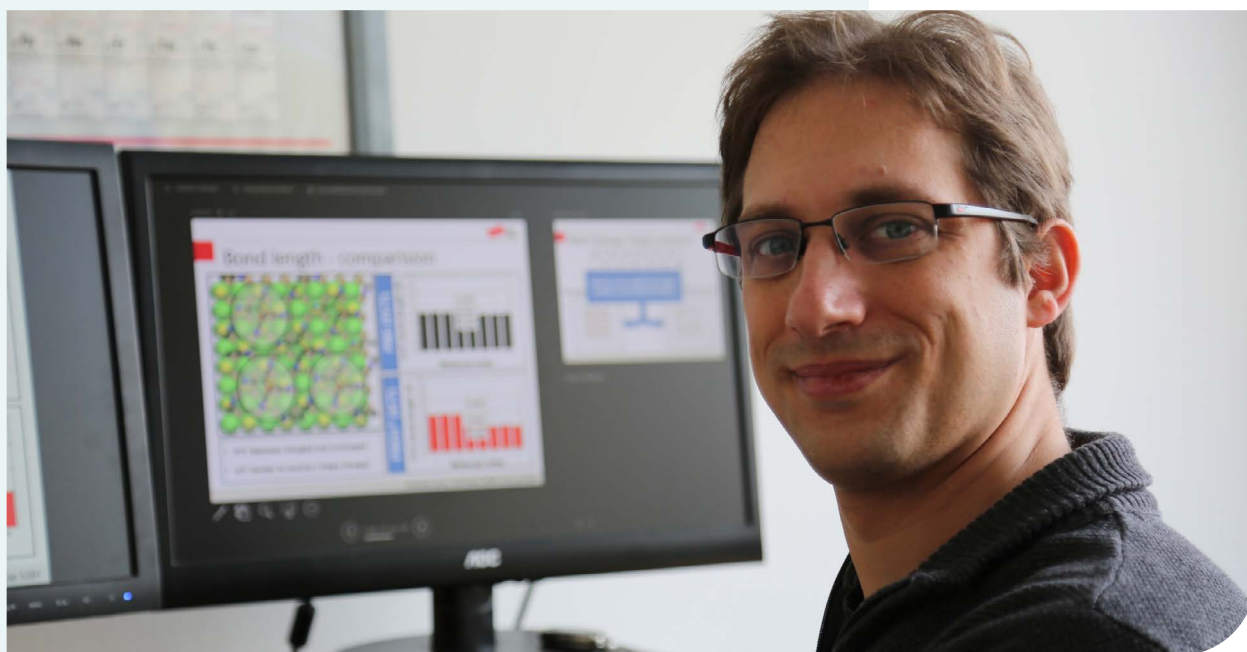
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MACHINE LEARNING METHODS PROVIDE NEW INSIGHTS INTO ORGANIC-INORGANIC INTERFACES



Contribution from Graz University of Technology



By combining two new machine-learning methods, TU Graz physicist Oliver Hofmann was able to refute theories on long-range charge transfer between organic and inorganic materials. © Baustädter – TU Graz

Oliver Hofmann and his research group at the Institute of Solid State Physics at TU Graz are working on the optimization of modern electronics. A key role in their research is played by interface properties of hybrid materials consisting of organic and inorganic components, which are used, for example, in OLED displays or organic solar cells. The team simulates these interface properties with machine-learning-based methods. The results are used

in the development of new materials to improve the efficiency of electronic components.

Long-range charge transfer as a subject of investigation

The researchers have now taken up the phenomenon of long-range charge transfer. A transfer of electrons from one material to another already occurs in the switched-off state if there are energetically more favorab-

le states for the electrons in the neighboring material. This raises the fundamental question of how far this transfer of electrons can extend in organic material, i.e. how many layers it encompasses. Many studies report that for organic-inorganic interfaces this effect is limited to the first layer, i.e. the layer where the (organic) molecules are in direct contact with the (inorganic) metal surface.

On the other hand, some reports assume that the effect also extends over longer distances, to the second layer or beyond. „If this is the case, the effect could be used to reduce the electrical resistance of the hybrid material, making it more energy efficient,“ says Hofmann, explaining why it is so interesting.

New examination method combines two machine learning methods

In order to demonstrate long-range charge transport in organic-inorganic interfaces, the researchers used the new machine learning methods SAMPLE and BOSS to investigate a coppertetracyanoethylene interface (TCNE/Cu(111)), “since there are particularly strong experimental data available here that indicate long-range charge transport,” said Hofmann. There is no clear theory why some systems show this effect. Hofmann and his team wanted to „solve this mystery in order to create a basis for how to produce materials with the same property.“

By combining both methods, the researchers were able to identify over two million potential interface structures for the TCNE-Cu interfaces and predict the behavior of the mole-

cules under various experimental conditions. Surprisingly, the results showed that there is no long-range charge transfer, but instead the molecules in the system change their structure.

Molecules change their atomic arrangement

When molecules are applied, usually they retain their general arrangement and pack more closely until, at a certain density, they finally start growing the second layer. In the TCNE/Cu(111) system, however, the adsorbed molecules change from the original lying position to a standing one after a certain amount has been deposited. They thus straighten up in order to be able to crowd even closer together. „However, standing molecules have a completely different charge transfer than lying molecules. The structural transformation is difficult to detect experimentally, but the measurement results are similar to those of long-range charge transport,“ explains Hofmann.

The investigations refute the hypothesis of long-range charge transfer. The use of the combined machine learning methods SAMPLE and BOSS is intended to support future experiments in material development in such a way that such misinterpretations no longer occur. By taking a deeper look into the physical processes, the new processes help to ensure that materials are no longer designed to chase an effect that does not exist in this form. Hofmann underlines the advantage of the new method: „Thanks to the two methods, millions of different structures can be simulated in the future.“

The TU Graz researchers recently published details of the study in [Advanced Science](#).

For his work in the field of material design Oliver Hofmann was awarded the [START Prize 2018](#) of the Austrian Science Fund FWF. A portrait of the TU Graz physicist can be found on [Planet Research](#).

This research project is anchored in the FoE „[Advanced Materials Science](#)“, one of the five Fields of Expertise of Graz University of Technology.

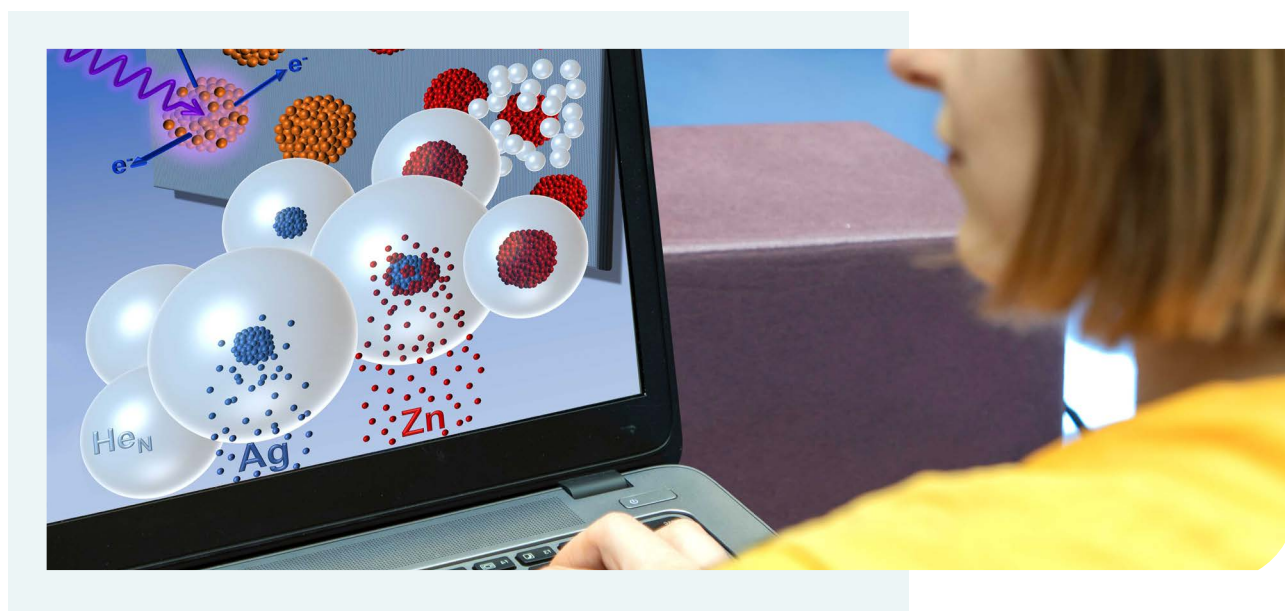
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TU GRAZ RESEARCHERS SYNTHESIZE NANOPARTICLES TAILORED FOR SPECIAL APPLICATIONS



Contribution from Graz University of Technology



In Nano Research, researchers at TU Graz have published new insights on the production of nanoparticles in superfluid helium droplets. Illustration: IEP; @ Lunghammer – TU Graz

“Core-shell” clusters pave the way for new efficient nanomaterials that make catalysts, magnetic and laser sensors or measuring devices for detecting electromagnetic radiation more efficient.

Whether in innovative high-tech materials, more powerful computer chips, pharmaceuticals or in the field of renewable energies, nanoparticles – smallest portions of bulk material – form the basis for a whole range of new technological developments. Due to the laws of quantum mechanics, such particles measuring only a few millionths of a millimeter can

behave completely differently in terms of conductivity, optics or robustness than the same material on a macroscopic scale. In addition, nanoparticles or nanoclusters have a very large catalytically effective surface area compared to their volume. For many applications this allows material savings while maintaining the same performance.

Further development of top-level research in Graz in the field of nanomaterials

Researchers at the Institute of Experimental Physics (IEP) at Graz University of Technolo-

gy have developed a method for assembling nanomaterials as desired. They let superfluid helium droplets of an internal temperature of 0.4 Kelvin (i.e. minus 273 degrees Celsius) fly through a vacuum chamber and selectively introduce individual atoms or molecules into these droplets. “There, they coalesce into a new aggregate and can be deposited on different substrates,” explains experimental physicist Wolfgang Ernst from TU Graz. He has been working on this so-called helium-droplet synthesis for twenty-five years now, has successfully developed it further during this time, and has produced continuous research at the highest international level, mostly performed in „Cluster Lab 3“, which has been set up specifically for this purpose at the IEP.

Reinforcement of catalytic properties

In [Nano Research](#), Ernst and his team now report on the targeted formation of so-called core-shell clusters using helium-droplet synthesis. The clusters have a 3-nanometer core of silver and a 1.5-nanometer-thick shell of zinc oxide. Zinc oxide is a semiconductor that is used, for example, in radiation detectors for measuring electromagnetic radiation or in photocatalysts for breaking down organic pollutants. The special thing about the material combination is that the silver core provides a plasmonic resonance, i.e. it absorbs light and thus causes a high light field amplification. This puts electrons in an excited state in the surrounding zinc oxide, thereby forming electron-hole pairs – small portions of energy that can be used elsewhere for chemical reactions, such as catalysis processes directly on the cluster surface. „The combination of the two material properties increases the efficiency of photocatalysts immensely. In addition, it

would be conceivable to use such a material in water splitting for hydrogen production,” says Ernst, naming a field of application.

Nanoparticles for laser and magnetic sensors

In addition to the silver-zinc oxide combination, the researchers produced other interesting core-shell clusters with a magnetic core of the elements iron, cobalt or nickel and a shell of gold. Gold also has a plasmonic effect and also protects the magnetic core from unwanted oxidation. These nanoclusters can be influenced and controlled both by lasers and by external magnetic fields and are suitable for sensor technologies, for example. For these material combinations, temperature-dependent stability measurements as well as theoretical calculations were carried out in collaboration with the IEP theory group led by Andreas Hauser and the team of Maria Pilar de Lara Castells ([Institute of Fundamental Physics at the Spanish National Research Council CSIC](#), Madrid) and can explain the behaviour at phase transitions such as alloy formation that deviates from macroscopic material samples. The results were published in the [Journal of Physical Chemistry](#). Ernst now hopes that the findings from the experiments will be rapidly transferred into new catalysts „as soon as possible“.

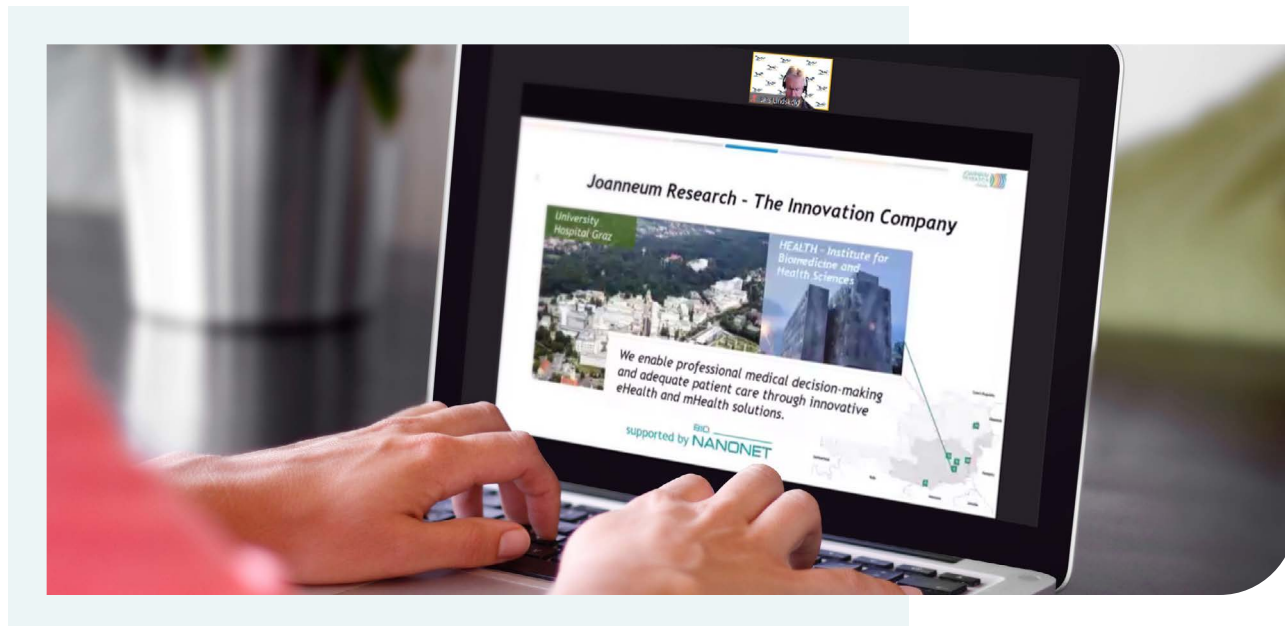
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BARS – REAL WORLD DATA FOR COVID-19 RISK STRATIFICATION



Contribution from JOANNEUM RESEARCH



JOANNEUM RESEARCH's Benchmarking and Reporting Service – BARS - can be utilized for COVID-19 risk stratification. Dr. Klaus Donsa, Head of Clinical Decision Support at JOANNEUM RESEARCH, presented BARS during the ScanBalt Digital Forum 2020 to an international audience. The forum took place on September, 9th 2020 with the aim to formulate a joint declaration on the necessary steps to create a Common European Health Data Space.

High quality real world data (RWD) to characterize elderlies at risk

For more than 12 years, the existing data warehouse and web-based data presentation

system BARS (Benchmarking and Reporting Service) has been used for quality assurance in healthcare in Austria and Germany. The system has been used by healthcare professionals in both countries to standardize RWD for patient care in geriatrics, diabetes, cardiovascular diseases and hepatitis C. Around 40% of all Austrian acute geriatrics and rehabilitation facilities use BARS and participate in an open audit and feedback quality assurance program. This led to a unique high quality data-base on quality of care, for healthcare planning, and research with data acquired under routine conditions. The BARS system is currently being respecified, modernized and linked to innovative eHealth systems for care

process support and decision support to improve nursing and elderly care. The current COVID pandemic has shown the need for such systems to be used for regional risk stratification in order to supply pandemic models with high quality RWD. Regional statements could already be drawn from the broad implementation of BARS in Austria.

Unknown potential for risks (frailty, COVID-19, ...)

The potential for risks is often unknown to healthcare professionals and healthcare decision makers, e.g. “What kind of complications have to be expected when surgery has to be performed in this particular patient?” or “How likely will a patient develop complications?”.

The required information for risk stratification is fragmented across multiple data sources and is often not available in a standardized way, although this information is necessary for efficient evidence-based decision-making and resource planning in healthcare.

Targeted use of resources in the care of the elderly

A large meta-analysis showed that older people living with frailty benefit significantly from targeted interventions that improve health and independence (Ellis et al. 2011, Cochrane). Due to limited healthcare resources, access to specialized healthcare facilities is often restricted and patients have to be selected based on certain criteria. On the individual patient level, age alone has little prognostic use – a simple screening factor is needed.

Frailty screening is internationally recognized to identify patients who will profit from tar-

Frailty is a common geriatric syndrome that entails an elevated risk of catastrophic declines in health and function among older adults.

Frailty is characterised by a functional decline across multiple physiological systems, accompanied by an increased vulnerability to stressors and results in major implications for clinical practice and public health.

geted interventions. Several different frailty-screening tools are available and widely used, most notably the Frailty Phenotype, the Electronic Frailty Index or the Clinical Frailty Scale. Recent studies have shown that frailty is also relevant for risk stratification in the current COVID pandemic, as COVID-19 disease outcomes were better predicted by frailty than either age or co-morbidity (Hewitt et al. 2020, Lancet).

Evidence-based resource planning

The modernization of BARS and its link to innovative eHealth systems (Fig 2) started in 2018 and was funded by the health fund Styria and Carinthia (Austria). This included the automated allocation of RWD from care processes for quality assurance and to enable prospective and retrospective risk stratification in the care of the elderly.

The linked Guidance System can be used outside the geriatric acute care units for frailty risk screening in emergency departments, surgery departments, etc. This system is currently under development as software as a medical device (SaMD).

Inside the geriatric acute care units, a Therapy/Monitoring System offers process support and decision support to capture high quality

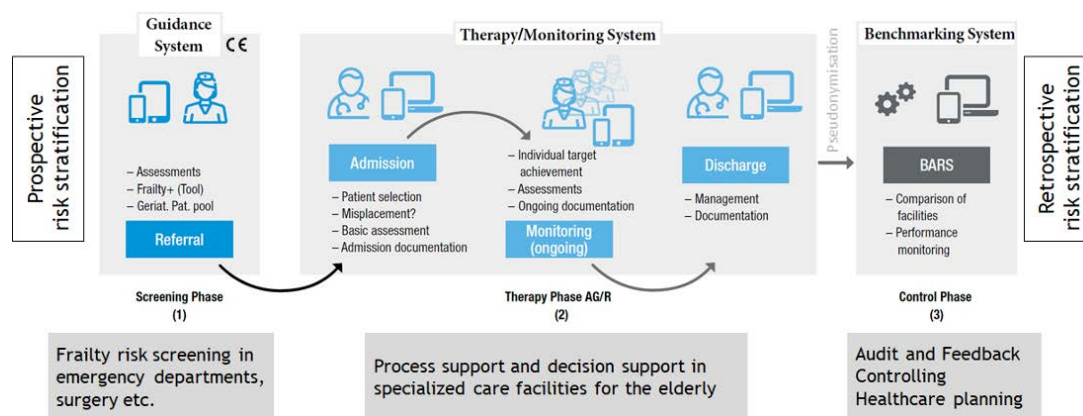


Fig 2: Risk stratification and quality assurance using BARS and the linked innovative eHealth systems

and structured RWD. Multiple pilots in hospitals are planned next year in different Austrian regions. The collected RWD enables:

- risk stratification for healthcare professionals on an individual patient level through the BARS Guidance System
- regional risk stratification for a severe disease progression (e.g. COVID-19 or the flu)

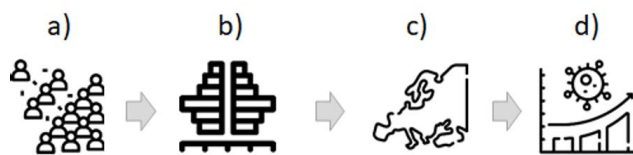


Fig 3: Evidence-based resource planning by means of: a) risk potential assessment based on frailty, co-morbidity, etc. b) demographic models, c) regional models, and d) pandemic models

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In Austria, the structured RWD in BARS from many institutions and regions allows characterization of the risk potential based on frailty, co-morbidities, demographics etc. using and applying a series of data models (Fig 3).

This enables informed, detailed resource planning for healthcare decision makers.

Conclusion

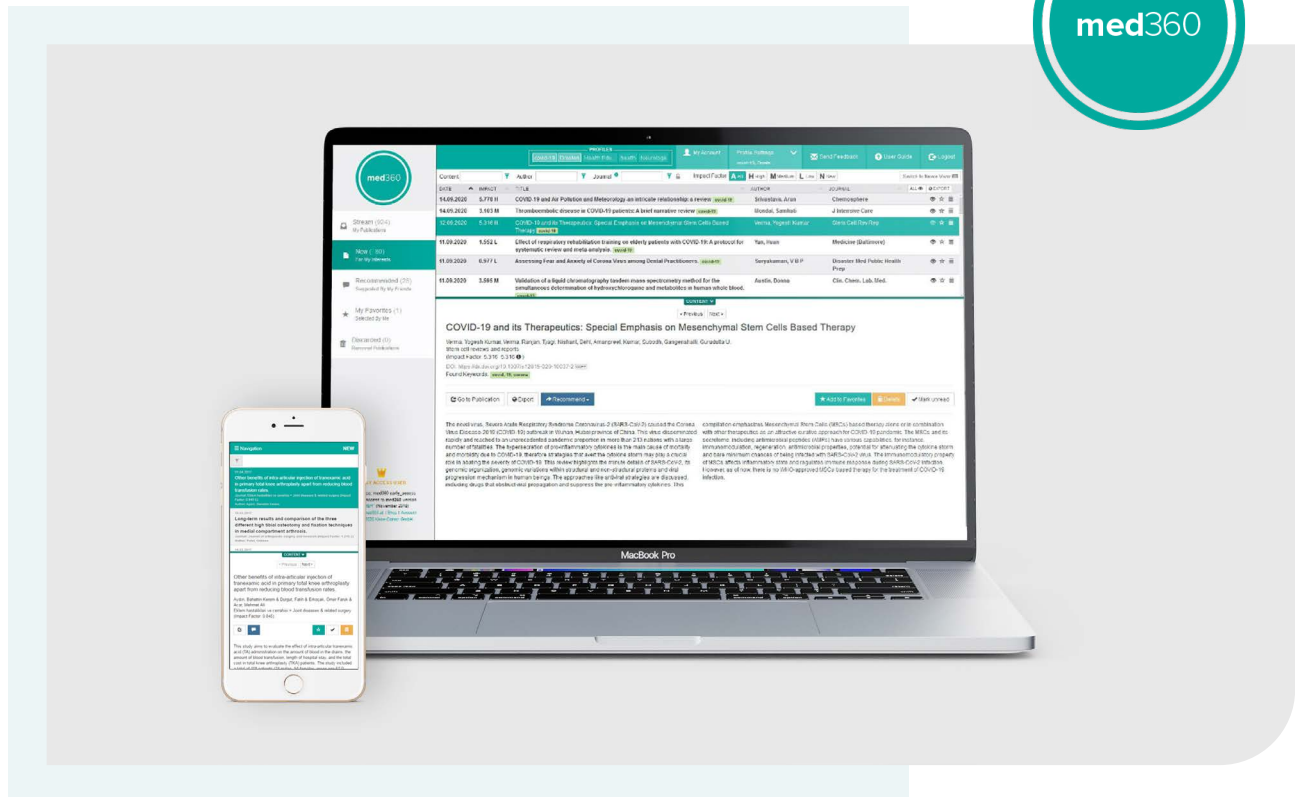
BARS enables automated and standardized collection of RWD from risk groups as well as prospective and retrospective identification of patients at risk. RWD on risk potential can be used for regional resource planning and to define risk mitigation measures, such as where to vaccinate first.

The Clinical Decision Support (CDS) group at JOANNEUM RESEARCH (JR) is working to improve medical treatment processes by developing advanced eHealth and mHealth solutions. JR is a member of the BioNanoNet association. Together they develop an initiative to support digital healthcare and perform research and development in the field of innovative healthcare delivery in Europe.

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SCIENTIFIC OUTPUTS OF NANOSOLVEIT H2020 PROJECT BEYOND THE QUARANTINE



Contribution from Novamechanics



Despite the unprecedented times due to COVID-19, 2020 has brought remarkable attention to the results of the collaborative work of the [NanoSolveIT](#) (Innovative Nanoinformatics models and tools: towards a Solid, verified and Integrated Approach to Predictive (eco)Toxicology) project, based on the intense efforts of the partners to share the scientific advances reached so far. Fifteen (15) articles have been peer-reviewed and published, providing an insight to the ongoing efforts towards advancing nanoinformatics and the challenges that are planned to be addressed within the scope of the project.

A systematic [NanoSolveIT](#) review has been published in the [‘Computational and Struc-](#)

[tural Biotechnology Journal’](#), describing the state-of-the-art in computational modelling for nanomaterials and the view of the consortium towards the development of innovative and integrated tools for in silico nanosafety assessment.

In parallel, [NanoSolveIT](#) coordinator, Dr. Andreas Afantitis, together with [NanoCommons](#) coordinator prof. Iseult Lynch, showcased in the [‘SCITECH Europa quarterly issue’](#) and the journal of ‘Combinatorial Chemistry & High Throughput Screening - CCHTS’ the research e-infrastructure of the two projects, which is under development for knowledge management and hosting of nanoinformatics tools and will support in silico nanosafety assessment,

and the prospective developments envisioned for the new decade respectively.

A series of review articles has been published in the journal 'Nanomaterials' to present the state-of-art on transcriptomics in toxicogenomics (TGx), specifically presenting the advances in Experimental Design, Technologies, Publicly Available Data, and Regulatory Aspects ([part I](#)) the Pre-processing and Differential Expression Analysis for High Quality Data ([part II](#)) and Data Modelling for Risk Assessment ([part III](#)).

A case study for analyzing the moderation of exposure medium and particle ageing on the toxicological effects of nanomaterials has been performed and the results are published in the 'Environmental Science: [Nano](#)' journal, providing an insight on more realistic exposure scenarios for nanomaterials using Daphnia Magna.

In close connection, a deep learning model for predicting the effects of exposure to engineered nanomaterials on Daphnia Magna has been proposed and developed. A workflow applying two different deep learning architectures on microscopic images of Daphnia magna is proposed for automatic detection of possible malformations. The results of this work are published in the '[SMALL](#)' journal.

A study on the prediction of zeta potential based on a read-across model using input data from image descriptors derived from TEM and calculated using the [NanoXtract](#) tool within the Enalos Cloud platform has been published in the '[SMALL](#)' journal.

A view on 'New Approach Methodologies' (NAMs), which is an interesting new concept in nanosafety and nanoinformatics due to the possible regulatory acceptance of safety data generated under NAMs, and how NAMs can be used towards rigorous materials production has been published in the '[SMALL](#)' journal.

A paper exploring the heterogeneous interactions between silver nanoparticles (AgNPs) and primary immune cells, through the use of Mass Cytometry and Single Cell RNA seq Profiling has been published in the '[SMALL](#)' journal.

A review paper exploring the great advances in the development and application of PBPK models for hazard assessment and risk assessment of NMs, despite the many challenges still present, has been published in the '[Nanomaterials](#)' journal.

One of the latest development within [NanoSolveIT](#) project is the Tindermix approach, which is proposed for modelling the effects of time and dose on the transcriptome to investigate the course of molecular alterations exerted in response to the exposure. The approach is showcased through a dual analysis and has been published in the '[GigaScience](#)' journal.

In close collaboration with the NMBP-13 project [RiskGONE](#), [NanoSolveIT](#) partners have contributed to the description of the envisioned framework for the risk governance of nanomaterials. The framework is expected to be operationalized by the Risk Governance Council and has been published in the '[SMALL](#)' journal.

In response to the COVID-19 crisis, a paper aiming to help understand the long-term effects of the virus via comparison with nanotoxicology and the exploration of similarities between the responses to SARS-CoV-2 and certain nanomaterials. The article has been published in [‘Nanotoday’](#).

We hope that this short overview of the results of the [NanoSolveIT](#) project so far can spike your interest to the project and we look forward to receiving your ideas, input or questions in relation to nanoinformatics, so feel free to contact us!

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The project has received funding from the European Union’s Horizon 2020 research and innovation program under the grant agreement n°814572.

NANOSAFETY ASSESSMENT OF COMMERCIAL GRAPHENE OXIDE IN THE EUKARYOTIC MODEL SACCHAROMYCES CEREVISIAE



Contribution from UBU-ICCRAM

BNN Member ICCRAM studies the toxicity mechanisms of graphene oxide in fungi.

Graphene oxide is a nanomaterial of great industrial interest, and many public and private initiatives have been launched during the last decade for the development of new technologies around this 2D carbon derived product. This material has become the focus of attention of biochemistry and biomedicine researchers due to its unique chemical and physical properties (e.g., surface chemistry, electromechanical properties, structural features, etc.), which make it suitable to be used in a number of applications from the technical, medical, environmental, and agricultural fields.

In most cases, graphene oxide risk assessment studies have been focused on mammalian cell lines and laboratory animals, where different mechanisms associated to its potential toxicity have been determined, namely, physical destruction, induction of oxidative stress, DNA damage, inflammatory response, apoptosis, autophagy, and necrosis. Although the biological impact of the nanomaterial has been also studied on microbial systems, only a limited number of studies have explored the toxicity mechanisms based on gene expression analysis. BNN Member ICCRAM, a competence Center of the University of Burgos (Spain)

devoted to advanced materials and Critical Raw Materials for advanced industrial technologies, has also a research line focused in the study of the toxicological properties of novel (nano)materials in human and environmental models. Recently, in the framework of H2020-MSCA-RISE projects NANOgentools (GA 691095) and CO2MPRISE (GA 734873), this institution was involved in a study where the toxicity mechanisms provoked by different commercial graphene oxide products in the fungal yeast *Saccharomyces cerevisiae* were determined (Laguna-Teno F., Suarez-Diez M. and Tamayo-Ramos J.A. (2020) Commonalities and Differences in the Transcriptional Response of the Model Fungus *Saccharomyces cerevisiae* to Different Commercial Graphene Oxide Materials. *Front. Microbiol.* 11:1943. doi: 10.3389/fmicb.2020.01943). To assess whether different commercial graphene oxide products could induce different toxicity responses in *S. cerevisiae*, two graphene derivatives: monolayer graphene oxide and graphene oxidenanocolloids were selected and the global transcriptional response of the yeast was compared. The results obtained in the mentioned study showed common and distinct cellular responses to both commercial graphene oxide products, which were very similar in their physico-chemical properties, indicating

that small disparities in manufacturing processes can result in a specific and divergent responses to these nanomaterials from biological systems. Small undetected distinct morphological features or observed differences in elemental composition might influence the nanomaterials reactivity, allowing them to elicit common and specific transcriptional responses in yeast. The most striking observation was that both nanomaterials induced common and specific responses associated to iron scar-

city and other stress factors, indicating that the ability of graphene oxide to adsorb molecules and ions can induce iron starvation or other nutritional stresses in microorganisms. The reported results contribute to understand the physiological response of fungal cells to the presence of graphene oxide, highlighting the relevance of determining the biological response of potentially exposed organisms to specific commercial nanomaterials.

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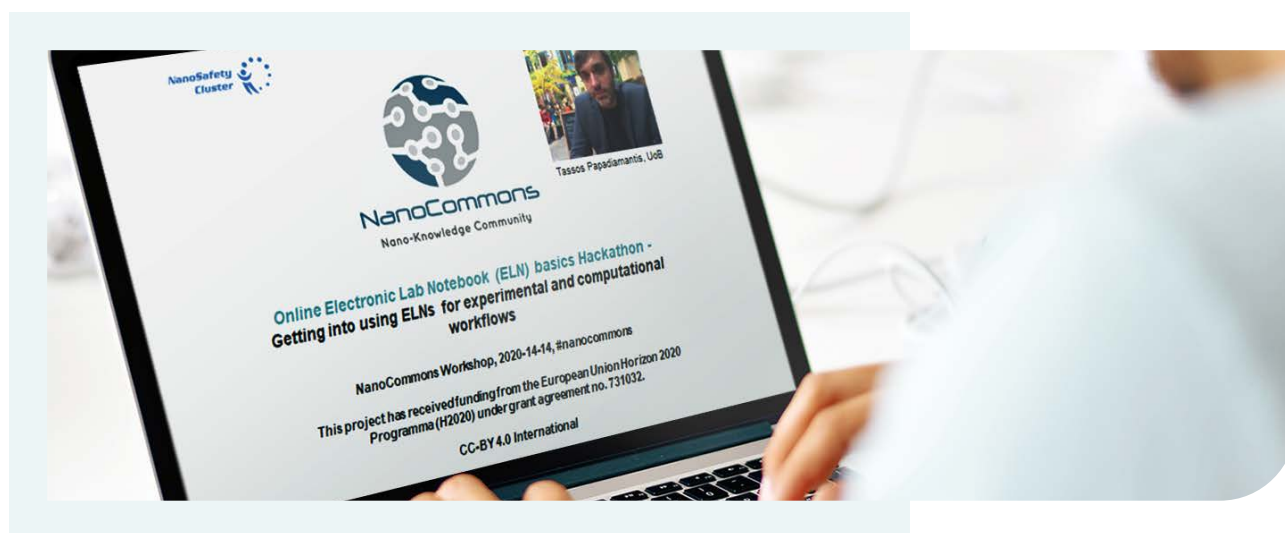
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BNN retrospect

NANOCOMMONS HACKATHON-REPORT:

“ONLINE ELN BASICS HACKA-THON”

14th of July, 2020



On Tuesday, July 14th 2020, the EU H2020 [NanoCommons](https://nanocommons.eu) project offered an online training session on Electronic Lab Notebooks, at a basic level, which was run by Anastasios Papadiamantis from the University of Birmingham, UK. (<https://orcid.org/0000-0002-1297-3104>, Twitter: @APapadiamantis). Under the subtitle “Getting into using ELNs for experimental and computational workflows” more than 40 registered participants learnt how to establish a workflow using Scinote-based electronic lab notebooks.

We started with a welcome by Martin Himly (PLUS), partner in the NanoCommons project and chair of the NanoSafety Cluster Work Group A on Communication, Education and

Training, overviewing the agenda of Online ELN basics Hackathon, followed by a short introduction round with some interactive questions using Mentimeter, as online poll tool, led by Lee Walker (UKCEH) to get to know the participants of the webinar.

As can be seen in the figure below, participants were from a significant number of different countries across Europe, being involved in several EU H2020 NanoSafety projects. The audience included some undergraduate students, mostly PhD candidates and post-doctoral fellows, and a few senior researchers including professors. There was a high share of academic and research institutes affiliates, however, approximately 20% of atten-

dees were employed at industrial stakeholder groups.

After the general introduction, Martin Himly gave a short overview on the NanoCommons project, its main aims and objectives, highlighting the importance of gathering data and making it findable, accessible, interoperable and reusable (FAIR), underlining the fact that making data FAIR does not mean that you lose the privacy of your data. Data can be embargoed until after exploitation of data, such as e.g. publication of a paper or completion of

a project, but after that, it could be shared with the community, enabling other researchers to build on that generated knowledge. Attendees were made acquainted with the [NanoCommons Knowledge Base](#) as a project-overarching data repository allowing also the crosstalk to other databases and with the [NanoCommons e-infrastructure](#), offering access to further information on past and future training and outreach events as well as to all currently online available training tools being structured in the four categories shown below:



The four categories of NanoCommons services aligned with the data life cycle from its generation to reuse for predictive models and storage under FAIR principles.

Participants were informed about the [TAs \(Transnational Access\)](#), the support that NanoCommons offers to the whole nanosafety community for a smooth implementation of the NanoCommons tools and tailored services.

The Online ELN basics Hackathon was continued by Tassos Papadiamantis (UoB) with an introduction to the [Scinote](#) ELN tool, highlighting the user-friendly cloud-based interface, the fact that there is a free version and that the ELN can be used both online and offline based on specific requirements. This platform was chosen by NanoCommons for being very dynamically evolving allowing local installation and Cloud-based access from PCs, notebooks, tablets, or even smartphones, as well as the creation of laboratory-overarching

projects and collaboration of teams around the globe.

ELNs are about sharing data and interacting with your lab team to work together on the same experiments and/or reuse what your colleagues have previously done. It is possible to invite work colleagues to your ELN or just to one of your projects and assign different roles/rights to each collaborator.

Main advantages of using ELNs:

- to provide a complete data management environment;
- to offer a complex workflow support, web services, digital and electronic sign-off, analysis and reporting capabilities;

- to be flexible enough to support automation of personalized adaptive workflows;
- to enable workflow standardization and template configuration for every experiment performed within a group/organization;
- to capture all appropriate metadata and QC of results;
- to establish an eco-friendly way to reduce the amount of paper a laboratory consumes.

It was a very interactive webinar with really active participants. The participants used the chat option to ask questions to the presenter. The participants were guided through the Scinote platform during the different hands-on sessions in order to instruct them how:

- to create new/manage/modify inventories (add samples and relate them to an experiment and you can do these imports either automatically or manually, further you can attach SDS files to a sample, etc.);
- to create new projects, add new persons for collaborate within an individual ELN project;
- to create experiments/workflows within a project with different tasks and link these tasks with each other;
- to add manually / import (own or external) protocols/assays for a workflow;
- to create versions of an existing protocol (on the master protocol, with the permit of the owner, or on a specific workflow protocol);
- to link a protocol to a task in a workflow;
- to assign a sample to a task or a whole workflow;

- to upload / import results.

Some [training materials](#) were made available for the webinar so the participants could “play” and get used to the Scinote ELN during the webinar: samples, protocols, safety data sheets (SDS), results, etc.

It was a well-attended webinar, with active and very interested participants who communicated their appreciation at the end of the webinar for the high interactivity and the gained skills.

The webinar recordings (recorded for educational purposes) as well as the training materials are available in the [NanoCommons Infrastructure](#), in Zenodo and in the [NanoCommons' Elixir TeSS](#) channel.

The NanoCommons team will be happy to answer any questions and to guide you in your requests! Please approach us by [email](#). 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.

Beatriz Alfaro Serrano (BNN, Graz, AT, beatriz.alfaro@bnn.at) leads the NanoCommons work package on Integration & Sustainability.

Martin Himly (PLUS, Salzburg, AT, martin.himly@sbg.ac.at; <http://orcid.org/0000-0001-5416-085X>) takes care of all Training issues within NanoCommons and is the chair of the EU NanoSafety Cluster - Work Group A on Communication, Training, and Education.

BNN ANNUAL FORUM & NETWORKING EVENT

17th of September, 2020, webmeeting



This year the BNN Annual Forum & Networking Session took place on 17th of September 2020. Due to COVID-19 situation it was performed as online meeting, attracting about 50 participants!

The BNN Annual Forum started with the presentation and discussion on the strategic development of the organization, including an outlook on activities planned. The scientific part of the event kicked off with presentations

from BioNanoNet members based in Upper Austria: Andreas HAIDER, Kompetenzzentrum Holz GmbH, gave a presentation on the determination of material properties at nano-scale for the design of bio-based materials with outstanding performance, Robert HOLZER, RECENTD GmbH, talked about cost-efficient process-analytics and bio-characterization, Nora MACK, Medizintechnik Cluster, Business Upper Austria – OÖ Wirtschaftsagentur GmbH,

spoke about innovation through cooperation: together on the path from the research idea to the innovative medical device and last but not least Daniel FECHTIG, PROFACTOR GmbH, presented innovative additive micro/nano manufacturing technologies for biosensors.

Furthermore, BioNanoNet members could learn about new members' competences by lectures from Biomax Informatics AG, ams AG, ACStyria Mobilitätscluster GmbH, My Biotech GmbH (formerly MJR PharmJet GmbH), Norner AS and NovaMechanics Ltd.

Furthermore, a Call Matchmaking was organized to open for all members the opportunity to identify potential collaborators with complementary expertise for specific call topics. All participants could learn more about other

members' call interest, extend their contacts and concretize their project ideas while thinking about potential consortia.

The final session of the day was in the frame of the NanoSyn-project a presentation by Stefan Köstner, FFG - Austrian Research Promotion Agency, giving an outlook to Horizon Europe with a focus to cluster 4.

The continuous growth of the network enables expanding the thematic horizon of BioNanoNet to the benefit of our members and thus supporting research and development activities in different branches.

If you are interested to join BNN, please contact us (office@bnn.at).

Conference calendar

BNN EVENTS & BNN CO-ORGANISED EVENTS



Bundesministerium
Klimaschutz, Umwelt,
Energie, Mobilität,
Innovation und Technologie



4th EU-Asia Dialogue on Nanosafety

Asia Nano Forum and EU NanoSafety Cluster Event

When? 7 October 2020 **Where?** online

This workshop is focused towards more synergy between Asian and European countries with respect to safe nanomaterials including standardization 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 process¹.
- 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 30th 2020: [Register here](#)

If you have any questions, please contact the organizers (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 organization 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”. [Read more here](#)

BNN PARTICIPATES

CLINAM 2020

When? 25 – 29 October 2020

Where? Basel, Switzerland

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

For more details 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!

For more details visit [event website](#)!

MEMBER EVENTS

European Researchers Night with the Motto "life is Science"

When? 27 November 2020 (8:00 – 20:00 CET)

Where? Gleisdorf, Austria & online meeting

The open event „Life is Science“ is taking place in the frame of the European Researchers' Night on 27th of November 2020. Together with our visitors and online participants we want to identify the connections between research in Life Sciences and the public's daily life.

Depending on COVID-19 restrictions it will be held as a virtual event with selected live sessions at the BISY (Biology for synthesis) company site. The (young) public is cordially invited to join us and participate in various activities:

- Science shows
- Lab tours (live and virtual)
- Workshops for pupils, kids and the general public
- Online games and quizzes
- Science speeches
- DIY experiments for at home and much more!

For more details visit [event website](#) or follow us on [Facebook](#) or [Twitter](#)!

If you are willing to contribute - even better! We are urgently looking for online activities (videos, live-streams to experimental science shows, webinars, online games etc.).

Don't hesitate to contact lis@acib.at

Austria's 1st Life Science Career Fair



When? 23 September 2020 – 31 March 2021

Where? Online

For more details visit [event website!](#)

NanoSAFE 2020 digital conference



When? 29 September 2020, 16:00

Where? Graz, Austria

For more details visit [event website!](#)

INNOlounge – Creativity meets Support**When?** 1 October 2020, 16:00**Where?** Graz, Austria (Styria Media Center – Skyroom)For more details visit [event website!](#)**Bioplastics Europe Stakeholder Meeting****When?** 7 October 2020, 10:00 a.m. – 13:00 p.m.**Where?** Online

In the frame of the H2020 Project „[Bioplastics Europe](#)“ acib is planning a national stakeholder meeting in order to bring together the Austrian research community in the bio-plastics sector. The event aims at creating synergies and at connecting the European project with the Austrian activities in this field.

Confirmed speakers:

- Harald Bleier (Ecoplus, Kunststoffcluster St. Pölten)
- Doris Ribitsch (acib / BOKU, IFA Tulln)
- Helmut Frischenschlager (Umweltbundesamt)
- Maximilian Lackner (Technikum Wien)
- Stephan Laske (Greiner Packaging)

The event will be hosted by Prof. Franz Stelzer and Dr. Anita Emmerstorfer-Augustin from acib in German language. The registration for the webinar will open by early September.

For more details visit [event website!](#) [Stay tuned!](#)**Digital Health & AAL – a new normal****When?** 22 October 2020, 16:00**Where?** tbaFor more details visit [event website!](#)

AICI forum digital

AICI forum digital

artificial intelligence in clinical imaging

30-31 OCT
2020
online AUSTRIA

When? 30 - 31 October 2020

Where? Online

For more details visit [event website!](#)

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Moving On – 25 years & beyond



MOBILITÄTSCluster


When? 13 – 14 October 2021

Where? Stadthalle Graz

hosted by ACstyria Mobilitätscluster GmbH

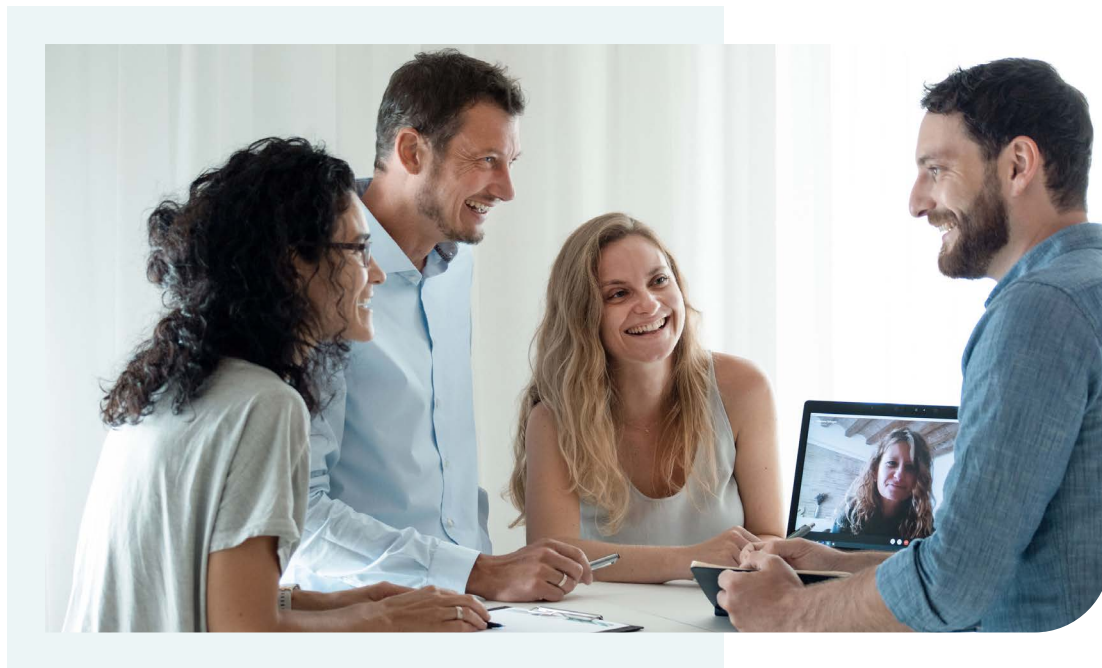
Being Europe's first and oldest mobility cluster is the result of constant change and renewal. Since our founding 25 years ago, more than 300 member companies are working at the forefront of innovation in the mobility industry. Their success in a competitive international environment is based on setting the right goals at the right time. We invite you and our members to our first international mobility congress, where we are going to discuss what mobility is going to mean in 25 years – and beyond!

Mobility is more than transportation. It's an essential part of tomorrow's societies, combining technology with the way we want to live and interact. Join our congress for a completely new and fresh perspective on an issue, that has always moved humanity: We will debate how society is going to change, and what impacts we can expect in the way we are going to use and need transportation. We are not going to host the next conference on the future of mobility, we are going for the big picture! This does not only include a detailed look under the hood of the cars and drones of tomorrow, but as well a curious search for innovators, inventors and breakthroughs that may be expected.

For more details 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.

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 December 2020. **BioNanoNet members are welcome to send their contributions until 10th of December 2020!**

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An abstract graphic on the right side of the page, rendered in a lighter shade of blue. It features a central vertical stem with several circular nodes of varying sizes. To the left of the central stem, there is a large circular node with a smaller concentric circle inside. To the right, there is a hexagonal shape. Below the central stem, there is another large circular node with a smaller concentric circle inside. The overall impression is that of a molecular or network diagram.

**INNOVATION IS THE KEY.
SUSTAINABILITY LEADS THE WAY.**

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