



BioSC Newsletter December 2021



Table of Contents

Newsletter relaunch: Please subscribe again	2
Christian Patermann Award 2022: The call is open	2
SEED FUND 3.0 - New projects: Plant protection, nutrient recycling, biomass conversion	4
SEED FUND 3.0 - New projects: Bioactive compounds, biobased recycling of plastics	6
BioSC office supports IACGB with secretariat	8
BioSC education in autumn 2021	8
25th BioSC Lecture by Prof. Daniela Thrän	11
Science Year 2020 21 Bioeconomy - The BioSC participated	12
Events and Calls	14

Newsletter relaunch: Please subscribe again

Starting in 2022, the BioSC newsletter will be sent using the third-party software rapidmail. For this we need you to subscribe again.

The privacy policy of rapidmail can be found [here](#). You can unsubscribe at any time by clicking on the link at the end of the newsletter.

We look forward to you registering again!

Christian Patermann Award 2022: The call is open



Dr. Michael Wustmans, University of Bonn, received the Christian Patermann Award 2021. Photo: Forschungszentrum Jülich

The development and implementation of a sustainable bioeconomy requires new inter- and transdisciplinary approaches in the training and development of young scientists. As part of the NRW strategy project BioSC, the Supervision Award has been honouring outstanding achievements by young scientists in supervising doctoral students since 2014. Since 2021, the BioSC Supervision Award has been presented as the Christian Patermann Award, named after the founder of the Knowledge-based Bioeconomy in Europe.

With the award, which is to be used in scientific work, the Bioeconomy Science Center (BioSC) honours

young scientists for special achievements and creativity regarding the quality of their professional and personal supervision of doctoral students. The review panel decides on the basis of the nominees' scientific excellence and supervisory performance. Networking, independence, scientific visibility and the promotion of "thinking outside the box" of the supervised doctoral researchers are further relevant selection criteria. The award is intended to improve the conditions for excellent career development of young scientists. In the case of equal professional qualifications and performance, preference is given to female scientists. A thematic restriction to specific topics of the bioeconomy is not intended.

Who can be nominated? Who can nominate?

All young scientists from the BioSC Core Groups who supervise PhD students during their doctoral studies can be nominated by Core Group leaders and PhD students.

The competition

The winner(s) will receive an award of up to EUR 25,000 as well as a certificate. The competition is part of the NRW strategy project BioSC. Documents and the call text including the prerequisites for the submission of nomination proposals can be found in the BioSC Intranet. The expert committee decides primarily on the basis of the excellent supervision and the ability of the scientists to motivate students and doctoral candidates to think interdisciplinary and thus also beyond their own "specialist area".

Deadline: 16 January 2022

SEED FUND 3.0 - New projects:

Plant protection, nutrient recycling, biomass conversion



Photo: Cristina Menta (CC BY 3.0)

ProRNA - Microbial production and application of dsRNAs as innovative bio-agents for new non-chemical crop protection strategies in agri- and horticulture

Project coordination: Dr. Tino Polen, IBG-1 Biotechnology, Forschungszentrum Jülich

Partners:

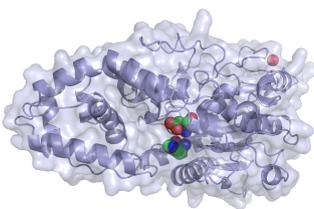
Dr. Sylvia Schleker, Prof. Dr. Florian Grundler, INRES - Molekulare Phytomedicine, University of Bonn

Dr. Tino Polen, Prof. Dr. Michael Bott, IBG-1 Biotechnology, Forschungszentrum Jülich

Soil-dwelling plant-parasitic nematodes cause annual economic damage of around 100 billion US dollars in crop cultivation worldwide. Chemicals to control them are harmful to the environment and banned in most countries. The ProRNA project aims to test whether the mechanism of RNA interference, in which the translation of a specific mRNA to protein is interrupted with the help of a complementary RNA, is suitable as an environmentally friendly alternative. However, the RNA must be "packaged" in such a way that it is not immediately degraded in the soil.

In the course of the project, target genes and suitable sequences for RNA interference are selected from the genome of a nematode species that infests carrots. Subsequently, production strains and expression cassettes are developed and the microbial production of double-stranded RNA is established. The obtained dsRNAs will be tested in different formulations *in vitro* and *in vivo* on nematodes, plants and soil samples.

Funding period: 24 months



Phytase model according to PDB 1HP

ScreenP - Metabolic burden coupled phytase screening for sustainable phosphate recycling

Project coordination: Dr. Anna Joëlle Ruff, ABBT - Biotechnology, RWTH Aachen

Partners:

René Hanke, Prof. Dr.-Ing. Jochen Büchs, AVT - Bioprocess Engineering, RWTH Aachen

Dr. Sabine Willbold, Dr. Stephan Küppers, ZEA-3 Analytics,

Forschungszentrum Jülich

Dr. Anna Joëlle Ruff, Prof. Dr. Ulrich Schwaneberg, ABBt - Biotechnology,
RWTH Aachen

Phosphate is a major component of fertilizer and essential for agriculture. Excess phosphate ends up in sewage sludge or in water bodies where it can harm the environment and is effectively lost for further use. At the same time, global phosphate reserves will be exhausted in 300 years at the latest. Concepts for the recovery of phosphate, e.g. from agricultural residual flows or wastewater, are therefore urgently needed.

In previous BioSC projects ([P-ENG](#), [QuantiP](#)), the enzymatic recovery of phosphate from rapeseed press cake using phytases was successfully carried out. In the ScreenP project, a novel product-specific high-throughput screening system for enzyme optimization will be developed to provide tailored phytases for different residual streams. Protein engineering methods will be combined with measurement of enzyme expression via the respiration rate of the production organism as well as NMR-based identification and quantification of the obtained phosphate.

Funding period: 12 months



Photo: istock/Judi
Parkinson

PREDIG - Modelling software to predict the enzymatic digestion of biomass

Project coordination: Dr. Adélaïde Raguin, Computational Cell Biology,
HHU Düsseldorf

Partners:

Dr. Holger Klose, Dr. Philipp M. Grande, Prof. Dr. Ulrich Schurr, IBG-2 Plant
Sciences, Forschungszentrum Jülich

Dr. Adélaïde Raguin, Prof. Dr. Martin Lercher, Computational Cell Biology,
HHU Düsseldorf

To improve the economic viability of biorefinery concepts, it is important to be able to make predictions about efficiency. An important process step in many biorefinery concepts is the enzymatic saccharification of lignocellulose. However, it is difficult to optimize due to the variability and heterogeneity of the substrate. Here, new methods for modeling as well as a deeper understanding of the underlying biochemical processes are needed.

Based on preliminary work, the PREDIG project aims to develop a free, open-source, modular and user-friendly software suitable for modeling saccharification processes for different types of biomass. Fundamental questions on mechanisms and kinetics as well as applied questions e.g. on optimal enzyme cocktails will be addressed. Experiments on the effect of structural properties of biomass on saccharification will complement existing data sets before the mathematical model is elaborated and a user interface is developed.

Funding period: 12 months

SEED FUND 3.0 - New projects:

Bioactive compounds, biobased recycling of plastics



Photo: Abdullah Sarhan
(CC BY-SA 4.0)

ToxPot - Evaluation of the potential of utilizing potato-side streams for extraction of alkaloids

Project coordination: Dr. Franziska Genzel, IBG-4 Bioinformatics, Forschungszentrum Jülich

Partners:

Dr. Thomas Classen, Prof. Dr. Jörg Pietruszka, Institut of Bioorganic Chemistry, HHU Düsseldorf

Dr. Sylvia Schleker, Prof. Dr. Florian Grundler, INRES - Molecular Phytomedicine, University of Bonn

Dr. Franziska Genzel, Dr. Anika Wiese-Klinkenberg, Prof. Dr. Björn Usadel, IBG-4 Bioinformatics, Forschungszentrum Jülich

The above-ground parts of potato plants remain unused in commercial cultivation. Potato berries and flowers in particular contain so-called steroid alkaloids, which have anti-carcinogenic and anti-inflammatory effects, as well as a large number of other alkaloids that are valuable feedstocks for synthesis of pharmaceuticals and also represent interesting candidates for biobased crop protection agents. Depending on the dose, however, they can have toxic effects on animals and humans, for example.

In the ToxPot project, the constituents from the above-ground parts of the potato plant will be analyzed and new compounds will be identified. Developmental and variety-specific differences will be investigated. Chemical and enzymatic methods are being developed to convert the alkaloids into derivatives with lower toxicity and unchanged or new bioactive properties. The derivatives will be tested for their effects on pests and non-target organisms in sugar beet cultivation.

Funding period: 24 months



Photo: IMET/JP

Viola - Towards violaceines - a mutasynthesis platform for tryptophan-derived alkaloids

Project coordination: Robin Weihmann, Institute of Molecular Enzyme Technology, HHU Düsseldorf, and Prof. Dr. Jörg Pietruszka, Institute of Bioorganic Chemistry, HHU Düsseldorf

Partners:

Robin Weihmann, Dr. Anita Loeschcke, Prof. Dr. Karl-Erich Jaeger, Institute of Molecular Enzyme Technology, HHU Düsseldorf

Prof. Dr. Marco Oldiges, Prof. Dr. Wolfgang Wiechert, IBG-1 Biotechnology, Forschungszentrum Jülich

Prof. Dr. Jörg Pietruszka, Institute of Bioorganic Chemistry, HHU Düsseldorf

Natural secondary metabolites provide an ample source of bioactive compounds for numerous applications, e. g. in the agricultural and pharmaceutical sectors. Tailored modification of their chemical structures is a powerful means to obtain compounds with enhanced or more selective bioactivity. The mutasynthesis concept utilizes a microorganism harboring a part of a recombinant biosynthetic pathway facilitating the conversion of externally added precursor analogs to new and more potent compounds. This was very successful in the BioSC FocusLab [CombiCom](#) for tripyrrole derivatisation using *Pseudomonas putida*.

In the Viola project, this approach will be broadened to establish a (bio)synthetic platform for indole alkaloids, here specifically using the example of (deoxy)violacein. A *P. putida* chassis for the conversion of violacein precursor analogs will be constructed, the analogs will be obtained by chemical synthesis, and suitable protocols for their effective conversion by *P. putida* to violacein derivatives will be established.

Funding period: 12 months



Photo: Joachim Kohler-HB
(CC BY-SA 4.0)

SSWEEP - Solvent swelling to enhance enzymatic and microbial plastics upcycling

Project coordination: Prof. Dr. Nick Wierckx, IBG-1 Biotechnology, Forschungszentrum Jülich

Partner:

Prof. Dr. Ulrich Schwaneberg, ABBt - Biotechnology, RWTH Aachen

Prof. Dr. Andreas Jupke, AVT - Fluid Process Engineering, RWTH Aachen

Prof. Dr. Nick Wierckx, IBG-1 Biotechnology, Forschungszentrum Jülich

Bio-upcycling of plastic waste is a rapidly developing scientific field with prominent applications in a circular bioeconomy. In particular, the development of enzymes that hydrolyze PET is already being pursued commercially. However, research is focused on their *in vitro* application and there is a knowledge gap with tremendous untapped potential regarding the underlying microbiology. This is mainly due to the fact that efficient PET hydrolysis only occurs at a temperature of about 70°C, when the polymer starts to soften.

The SSWEEP project aims at enabling PET hydrolysis at 30-40°C by using plasticizing solvents and thus opening up the field of PET hydrolysis for bioprocess applications. The use of solvents will also enable the

upcycling of a currently non-recyclable material in the future, namely PET/PE composite films. During the project, biocompatible solvents will be identified and a solvent-tolerant PETase and production organism will be developed.

Funding period: 24 months

BioSC Office supports IACGB with secretariat



**International
Advisory Council on
Global Bioeconomy**

Since spring 2021, the BioSC office supports the International Advisory Council on Global Bioeconomy as scientific secretariat. In early 2022, a new IACGB website will be launched. The independent think tank IACGB has for example initiated, designed and organised the Global Bioeconomy Summit and published the Global Bioeconomy Policy Reports in recent years.

The International Advisory Council on Global Bioeconomy (IACGB) is an independent think tank of forty high-level policy experts and drivers of the bioeconomy worldwide.

The IACGB intends to act like a platform of platforms to facilitate international collaboration and mutual exchange in all aspects of relevance for sustainable and circular bioeconomy development by working together with multiple stakeholders across the globe, through leading representatives from policy, science, civil society and the business sector.

The IACGB initiated, designs and organizes the Global Bioeconomy Summit, a leading global conference and platform for exchange of recent developments for a sustainable and circular bioeconomy worldwide.

The BioSC office has been supporting the think tank as scientific secretariat since spring 2021. In early 2022, a new website will be launched to provide information about the IACGB's members, goals and activities, as well as bioeconomy strategies and developments worldwide.

BioSC education in autumn 2021

New research projects for doctoral students at the BioSC

In September 2021, PhD students in BioSC Core Groups had the opportunity to apply for interdisciplinary small projects covering different BioSC locations and research areas. Two projects are funded as of December 2021. A new call for doctoral projects will be issued at the beginning of 2022.

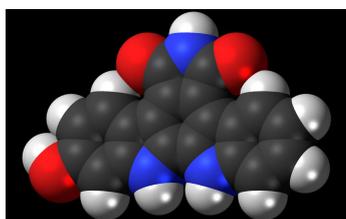


Photo: Jynto (CC0)

ARCyria - Biologically active indolocarbazoles: Advanced Recombinant production of Arcyriaflavins

Luzie Kruse, Nora Bitzenhofer, Molekulare Enzymtechnologie, HHU Düsseldorf

Alexander Reiter, Biotechnologie, Forschungszentrum Jülich
Marcel Schatton, Bioorganische Chemie, HHU Düsseldorf

Natural indole carbazoles are a valuable source of bioactive compounds with numerous potential applications, especially in the pharmaceutical industry. The aim of the ARCyria project is a biosynthesis-integrated derivatisation of the chemical structure of arcyriaflavin A to obtain novel compounds and thus expand the arcyriaflavin family. For this purpose, suitable oxidoreductases for the derivatisation of the precursor compounds will be identified and implemented into the biosynthetic pathway. The newly created biosynthesis modules will be investigated in the new, antibiotic-tolerant production host *Neopseudomonas*.

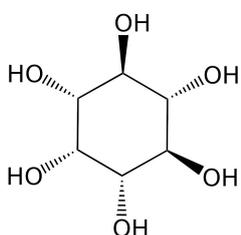


Image: Kupirijo (CC BY-3.0)

InoDH - Combining bioinformatics and biotechnology for the production of valuable inositol isomers

Paul Ramp, Biotechnologie, Forschungszentrum Jülich

Jonas Dittrich, Pharmazeutische und medizinische Chemie, HHU Düsseldorf

Inositols are promising candidates for food supplements due to various health-promoting properties. The InoDH project focuses on the biochemical and structural characterisation of inositol dehydrogenases from *Corynebacterium glutamicum* to analyse their potential for producing valuable inositol isomers. Based on structural models and molecular dynamics simulations, a selection of inositol dehydrogenases will be made. These will be produced, purified and biochemically characterised. Finally, promising enzyme

candidates will be used to establish a process for the cost-effective production of inositol isomers.



6th NRW PhD Day "Future Bioeconomy"

The 6th NRW PhD Day took place on 28 September 2021 as a virtual event, this time on the topic of "Future Food - sustainable and efficient production".

In their welcoming addresses, Prof. Dr. Frauke Melchior (Member of the Board of Directors, Forschungszentrum Jülich) and Dr. Sonja Brandt (Ministry of Culture and Science NRW) addressed the doctoral students directly and emphasised the potential of the bioeconomy as a future employer as well as the importance of networks and the use of diverse, existing opportunities for professional development.

In the first presentation, Dr. Ananya Manna (European Circular Bioeconomy Fund) gave an overview of the highly active bioeconomy start-up landscape in Europe. Dr. Katarzyna Wolińska-Griese (Infarm) and Dr. Britta Winterberg (Formo) then presented innovations that can reduce the carbon footprint of food production. Infarm, for example, produces vegetables directly in the supermarket, eliminating many intermediate steps such as harvesting, packaging and transport. Formo uses bacteria to produce milk that contains almost all the classic components of cow's milk and from which dairy products such as cheese can be made - but without the high CO₂ emissions of dairy farming.

Sören Schilasky (Pfeifer & Langen) impressively demonstrated that his company, which is mainly associated with beet sugar products, is developing completely new approaches towards "new sugars". In addition, like all the other speakers, he described his own career path and encouraged the doctoral students to think "outside the box" and to dare to make initiative applications. Finally, Dr. Peter van der Schaaf (Axxence Aromatic) vividly presented the range of bio-based production of flavours from bacterial

conversions to extraction directly from plants.

In the afternoon, the PhD students, the morning speakers and the coordinators of the organising organisations and graduate schools had an extensive opportunity to discuss issues relating to the bioeconomy and personal career development. Again this year, the NRW PhD Day achieved its goal of bringing together young doctoral researchers from different disciplines and locations in NRW and providing them with a framework for networking and discussion about future developments and career paths in the bioeconomy.



Photo: Forschungszentrum Jülich

Pupils' symposium "Biobased into the future with plants, microbes & co."

On 28 and 29 October, a pupils' symposium focusing on the bioeconomy took place on the Haus Overbach campus in Jülich, organised by the BioökonomieREVIER initiative, the BioSC and the Science College Overbach.

Around 60 students from partner schools of the Science College from all over Germany and Belgium took part in the hybrid event. Exciting insights into their fields were given by Prof. Dr. Christoph Buchal, Prof. Dr. Ulrich Schurr, Dr. Thomas Pütz and Dr. Onno Muller from Forschungszentrum Jülich, Dr. Oliver Bonkamp from Biosecurity Management GmbH, Lars Schäfers from the Catholic Central Office for Social Sciences and Prof. Dr. Claudia Knief and Prof. Dr. Jan Börner from the University of Bonn. Based on the lectures, the school students worked in small groups on issues related to agriculture, food security, land competition, resource transition, the wealth of countries and the participation of society. At the end, each group presented their results in plenary, whereby the self-chosen presentation formats ranged from posters to role plays. In this way, the students were able to expand their knowledge base on the future topic of the bioeconomy in contact with researchers and experts.



Photo: UFZ

25th BioSC Lecture by Prof. Daniela Thrän

The 25th BioSC Lecture took place as part of the Jülich Biotec Day 2021. Prof. Dr. Daniela Thrän, Co-Chair of the Bioeconomy Council of the German Federal Government, highlighted the opportunities and difficulties in establishing a sustainable bioeconomy.

In her lecture "**How to develop a sustainable bioeconomy**", Prof. Thrän first reminded the audience of the **concept of planetary boundaries**. Mankind has always used biological processes such as photosynthesis, growth, conversion and decomposition of biomass, and has also developed these

processes further - initially in breeding, and later in biotechnology and process engineering, for example. However, the natural basis for this is limited, first and foremost the land. Most of the land available for biomass production is already being used today, so establishing a bioeconomy must be about **improving biomass use**, such as increasing efficiency, rather than expanding it. For example, the energy content of biomass produced today annually is an estimated 200 exajoules, but about 75% of that is lost during processing. Prof. Thrän named three central approaches: 1. stabilization of the demand for biomass, 2. sustainable production and 3. sustainable use.

With regard to **stabilizing the demand for biomass**, Prof. Thrän pointed out that it will not be possible to completely replace fossil resources with biomass. Especially for the areas of mobility, electricity and heat supply, it is essential to expand the use of other renewable resources such as wind and solar energy, she said. She also mentioned the use of residual flows from agriculture, forestry and food production, as well as a reduction in meat consumption, as other important elements for stabilizing demand.

In order to ensure the **sustainable production of biomass**, certification plays a decisive role, according to Prof. Thrän - from cultivation to transport, processing and conversion into products. In view of the large number of existing certifications, an important task for the next years will be to standardize the requirements and criteria, at least in outline, as has been achieved for the European biofuel market since 2009.

For a **sustainable use of biomass**, the principle of circular value creation with cascade use, recycling and upcycling will be of decisive importance. The bioeconomy in Germany, for example, is still very linear and the potential of residual flows is far from being exploited. A major challenge lies in the large number of laws and regulations that need to be taken into account.

As **key elements for the establishment of a sustainable bioeconomy**, Prof. Thrän named, among others, research and development, best practice examples, incentives and financing. She particularly emphasized the **importance of regional implementation strategies** that address regional specifics and network local players, citing the Rhenish mining region as an example, where the transformation from a coal-mining region to a model region for a sustainable bioeconomy is being pursued.

Science Year 2020|21 Bioeconomy - The BioSC participated

The Science Year 2020|21 Bioeconomy came to an end on November 29 with a digital closing event looking back on numerous events and funded projects. Among the winners of the 2020 and 2021 university competitions that received awards at the event was the podcast KRAUTNAH from the Institute of Plant Physiology at RWTH Aachen University - one of the contributions to the Science Year coming from BioSC. Another BioSC contribution was the exhibit "Clean Water Through Algae" on the MS Wissenschaft.



Photo and Image: David Spencer, RWTH Aachen

The **podcast KRAUTNAH** was all about plant research, plant breeding and green biotechnology. In 20 episodes, researchers from the Institute of Plant Physiology at RWTH Aachen University traced the history of plant cultivation, right up to today's genetic engineering. In addition to science, voices from politics, agriculture and breeding had their say, and the audience could also participate.

[More Information](#)



Image: Wissenschaft im Dialog

On June 16, 2021, the talk series **„Karliczek.Impulse.“** focused on **biotechnology** as one of the central technologies of the bioeconomy. Prof. Dr. Karl-Erich Jaeger, Director of the Institute for Molecular Enzyme Technology at HHU Düsseldorf, gave the keynote speech. The subsequent discussion focused on how biotechnology and, in particular, enzyme technology can contribute to a sustainable bioeconomy today and in the future.

[More Information](#)



Photo: Heiner Witte/Wissenschaft im Dialog

The **MS Wissenschaft**, which has been traveling for many years as an exhibition ship as part of the Science Years, hosted in 2020 and 2021, among others, the **exhibit „Clean water through algae“** from IBG-2 Plant Sciences, Forschungszentrum Jülich. It illustrates AlgalTurfScrubbing in the form of a pinball machine, in which wastewater is passed over an algal turf that absorbs nutrients such as nitrate and phosphate from the water. The result is clean water and a nutrient-rich algae biomass that can be used as fertilizer. Thus, the nutrients are recycled instead of ending up in sewage sludge or water bodies. At the "Algae Flipper," phosphate and nitrate are represented by colored balls that are held magnetically on a surface and can be "harvested." The exhibit was very popular among visitors of the MS Wissenschaft.

[More Information](#)

Events and Calls

Events (selected)

Online Information Events: Missions in Horizon Europe - Your funding opportunities (Events in German)

January 11-27, 2022

[More Information](#)

CLIB International Conference, Duesseldorf & online

February 1-2, 2022

[More Information](#)

International Conference on Cellulose Fibres, Cologne & online

February 2-3, 2022

[More Information](#)

15th International Conference on Biofuels and Bioenergy, online

March 23-24, 2022

[More Information](#)

Digicrop - International Conference on Digital Technologies for Sustainable Crop Production, online

March 28-30, 2022

[More Information](#)

Calls (selected)

REGULUS - Regionale Innovationsgruppen für eine klimaschützende Wald- und Holzwirtschaft (BMBF)

January 31, 2022

[More Information](#)

Neue Produkte für die Bioökonomie (BMBF)

February 1, 2022

[More Information](#)

ABC/J Young Academics Award 2022

February 28, 2022

[More Information](#)

**Innovationen für gesunde Kulturpflanzen und nachhaltige Verfahren des Pflanzenschutzes
(BMBF)**

March 10, 2022

[More Information](#)