



LEIBNIZ SCIENCE CAMPUS
PHOSPHORUS RESEARCH
ROSTOCK



Activity Report 2017

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1 Development of the Leibniz ScienceCampus Phosphorus Research Rostock (Introduction)

The Leibniz-ScienceCampus Phosphorus Research Rostock (LWC) is linking the phosphorus research of more than 100 scientists from 6 research institutes in different disciplines working in around 35 third-party funded projects. It focuses on three main areas in the support of phosphorus research by its members: strengthening of **networking, internationalization** and funding of **graduate students**.

In 2017, numerous events were initiated by the LWC to promote networking at all levels. Internal meetings and workshops took place to intensify both the networking of scientists at the ScienceCampus Rostock and scientific cooperation/exchange among them. Besides the events for the PhD-students being involved in phosphorus research, regular meetings took place between different groups of the ScienceCampus Rostock. In the winter semester 2016/2017 the second lecture series phosphorus research was held at the University of Rostock, where regional authorities were actively integrated. Especially, an internal Symposium (06.-07.04.2017) and an international Symposium (08.-09.11.2017), at which the international scientific advisory council of the P-Campus participated, can be highlighted as events for all members of the ScienceCampus. Furthermore, the ScienceCampus Rostock is an active member of the 'Deutsche Phosphor Plattform (DPP)' and the European Sustainable Phosphorus Platform (ESPP). Prof. P. Leinweber, member of the ScienceCampus Rostock, was elected again for the board of the DPP. Further networking activities were e.g. the integration of around 20 further PhD students of partner institutes with topics in the field of phosphorus research from various sources of funding.

An important milestone in terms of **internationalization** was the publication of an international special issue of the journal AMBIO. This special issue resulted from the 8th International Phosphorus Workshop (IPW8) in September 2016, which was organized by the ScienceCampus Rostock. The publication of this special issue was especially useful for international linkage, to increase reputation of the ScienceCampus and for publication of numerous works by scientists of the P-Campus. In seven out of 14 articles in the special issue, scientists of the ScienceCampus were co-authors. A summary article written by ScienceCampus members and external experts provided an overview of the topic. Moreover, members of the ScienceCampus Rostock are internationally active all year round. The ScienceCampus Rostock has contributed to the financial support of young scientists in their international activities, e.g.: research stay at the University of Uppsala (Sweden), measurements at the synchrotron in Saskatoon (Canada) and conferences in Murcia (Spain) and Hawaii. Without financial support of the ScienceCampus, these measurements, analyses and conference trips would not have been possible for the young scientists.

The **graduate school phosphorus research** is the core of the graduate concept of the ScienceCampus Rostock and has the overarching goal of an excellent graduate education. Thematic training and the lively exchange of information among PhD students were supported by different events such as thematic workshops, professional training and informal meetings.

In 2017, several important third party funded projects, which can be assigned to the ScienceCampus Rostock, were raised or started (Tab. 1). Even if several projects do only in parts deal with phosphorus – due to close linkage of P to other elements or P is interest-

ing in many different areas – three new projects focusing in phosphorus can be highlighted:

PEGaSus: Phosphorus efficiency in *Gallus gallus* and *Sus scrofa* (ERA-NET SusAn 09/2017-08/2020), P-FOWL: Inositolphosphate und Myo-Inositol beim Geflügel (subproject in the DFG research unit P-FOWL, 09/2017-08/2020) and NuReDrain: Innovative **NU**trient catching **RE**active barrier and controlled **D**rainage technologies for sustainable growth of the agriculture sector (North Sea Region Programme, 2017-2020). Fortunately, the second phase of the project InnoSoilPhos, focussing on P on different scales, was received at the end of 2017, starting in March 2018.

In preparation to the follow-up application to the Leibniz Association, thematic concepts and projects for doctoral theses were developed in workshops (internal competition procedure) during 2017. Seed projects, developed 2016 and financed by the Leibniz funding for the P-Campus, started 2017 and were administratively supported by the coordination office.

Some important publications for 2017 can be highlighted as examples of successful publications:

3 Publications (see publication list 3.4) of the ScienceCampus Rostock were honoured as "Publication of the year 2017". For these publications, a number of members of the LWC were co-authors:

Baumann, K.; Glaser, K.; Mutz, J.-E.; Karsten, U.; MacLennan, A.; Hu, Y.; Michalik, D.; Kruse, J.; Eckhardt, K.-U.; Schall, P.; Leinweber, P. (2017): **Biological soil crusts of temperate forests: Their role in P cycling**. *Soil Biology and Biochemistry* 109: 15-166. DOI: 10.1016/j.soilbio.2017.02.011

Nausch, M.; Woelk, J.; Kahle, P.; Nausch, G.; Leipe, T.; Lennartz, B. (2017): **Phosphorus fractions in discharges from artificially drained lowland catchments (Warnow River, Baltic Sea)**. *Agricultural Water Management* 187: 77-87. DOI: 10.1016/j.agwat.2017.03.006

Steinbauer, J.; Longwitz, L.; Frank, M.; Epping, J.; Kragl, U.; Werner, T. (2017): **Immobilized bifunctional phosphonium salts as recyclable organocatalysts in the cycloaddition of CO₂ and epoxides**. *Green Chemistry* 19: 4435-4445. DOI: 10.1039/C7GC01782K

In 2017, two articles dealing with the plant protection product glyphosate, were published; one about the sorption of glyphosate or its metabolites at the soil (Gros et al. 2017) and the other one about the sediment of the Baltic Sea (Skeff et al. 2017). The publication of Gros et al. has to be particularly highlighted: in this publication the classical sorption experiment, quantum chemical modelling of glyphosate binding and mass-spectrometric characterisation of soil organic matter were combined with each other for the first time.

Gros, P.; Ahmed, A.; Kühn, O.; Leinweber, P. (2017): **Glyphosate binding in soil as revealed by sorption experiments and quantum-chemical modeling**. *Science of the Total Environment* 586: 527-535.

Skeff, W.; Recknagel, C.; Düwel, Y.; Schulz-Bull, D.E. (2018): **Adsorption behaviors of glyphosate, glufosinate, aminomethylphosphonic acid, and 2-aminoethylphosphonic acid on three typical Baltic Sea sediments**. *Marine Chemistry* 198, 1-9, DOI: 10.1016/j.marchem.2017.11.008

According to the main topic efficient and sufficient P-use in cluster 2, three publications have to be highlighted (Morshedizad & Leinweber 2017, Vogel et al. 2017 a und b). Since P-sources for P-fertilizer production are limited and often contaminated by Cd, the usage of alternative P-recycling fertilizers and the research on their effects on soil and plant growth is of special importance for an agriculture which has to secure nutrition for future generations. Morshedizad and Leinweber (2017) investigated the effects of bone char on dissolution and leaching of P and especially Cd, which is a contaminant from mineral P-fertilizers. As removal of P from waste water will increase in importance due to the new "Klärschlammverordnung" (sewage sludge regulation) and the urgent need of P-recycling from waste, the two publications of Vogel et al. 2017 a and b, which deal with the usage of such recycling-P-fertilizers for plant nutrition, can be highlighted.

Morshedizad, M. & Leinweber, P. (2017): **Leaching of phosphorus and cadmium in soils amended with different bone chars.** CLEAN – Soil, Air, Water 45 (8), DOI: 10.1002/clen.201600635

Vogel, T.; Kruse, J.; Siebers, N.; Nelles, M.; Eichler-Löbermann, B. (2017a): **Recycled products from municipal wastewater: composition and effects on phosphorus mobility in a sandy soil.** Journal of Environmental Quality 46 [2]: 443-451.

Vogel, T.; Nelles, M.; Eichler-Löbermann, B. (2017b): **Phosphorus effects of recycled products from municipal wastewater on crops in a field experiment.** Plant, Soil and Environment (PSE) 63 [10]: 475–482, DOI: 10.17221/513/2017-PSE

The public relations work of the ScienceCampus Rostock in 2017 included, but was not limited to, text writing and publishing, presentations and maintenance of the website, and representation of the ScienceCampus Rostock by an information stand at the University of Rostock during the Long Night of Sciences.

2 Goals and concept

The overarching goal of interdisciplinary cooperation at the Leibniz ScienceCampus Phosphorus Research Rostock is, through a thematically oriented integrated network, to explore options for the more sustainable management of phosphorus. Further focuses of the ScienceCampus, in addition to the sufficient and efficient use and recycling and recovery of phosphorus, are phosphorus cycles and fluxes in the environment and the environmental problems, in particular in aquatic systems, caused by inefficient phosphorus use or a lack of phosphorus recycling. Expertise in various aspects of research into the essential and irreplaceable element phosphorus, diverse phosphorus-containing chemical compounds, and specific modes of action of phosphorus in agricultural and environmental systems as well as in technical and industrial processes are brought together at the ScienceCampus Rostock. Cooperation and research are intensified and strong national and international networks established.

The following institutes are partners of the ScienceCampus Rostock:

- ▶ Leibniz Institute for Catalysis (LIKAT) at the University of Rostock
- ▶ Leibniz Institute for Farm Animal Biology (FBN), Dummerstorf
- ▶ Leibniz Institute for Baltic Sea Research Warnemünde (IOW)
- ▶ Leibniz Institute for Plant Genetics and Crop Plant Research (IPK), Satellite Collections North, Groß Lüsewitz
- ▶ Leibniz Institute for Plasma Research and Technology (INP), Greifswald

- ▶ University of Rostock (UoR; Faculty of Agricultural and Environmental Sciences, Interdisciplinary Faculty, Faculty of Law, Faculty of Mathematics and Natural Sciences, Rostock University Medical Centre)

3 Research

3.1 Research foci

The research foci of the ScienceCampus Rostock are:

- ▶ Cluster I: Phosphorus cycles and fluxes in the environment
- ▶ Cluster II: Sufficiency and efficiency of phosphorus utilisation, phosphorus recycling
- ▶ Cluster III: Syntheses of and with Phosphorus-Containing Compounds (former: Phosphorus as an element in and as result of catalytic processes)
- ▶ Cross-cutting activity: The development of advanced phosphorus analysis methods

3.1.1 Cluster I: Phosphorus cycles and fluxes in the environment

Phosphorus ends up in the environment through open-ended industrial cycles and along river flows, reaching the sea. The aim is a better understanding of P fluxes and cycles in the environment in order, on the one hand, to analyze the effects of high P inputs and, on the other, to enable discussion of protection and/or rehabilitation measures. This starts at the "sources", for example with the application of fertilizer on agricultural land and the effects of artificial drainage (drain systems), but also at the river outlets of small and large wastewater treatment plants. And it continues through phosphorus fluxes in different ecosystems, from special soil crusts to coastal waters and into the large Baltic Sea basin. Methodological approaches in Cluster I include measurements on the smallest scale up to the Baltic Sea ecosystem modelling over a wide range of scales and instrumentation.

3.1.2 Cluster II: Sufficiency and efficiency of P utilization, P recycling

The goal is to formulate a scientific basis with which to derive the necessary legal framework and policy recommendations for the sustainable management of regional and global closed P-fluxes in accordance with the principles of sufficiency and efficiency. Sufficiency means to limit the application rates of P for the production of plant and animal foods to the level actually required. This requires critical evaluations of existing P-fertilization and feed recommendations with the aim of reducing P-use in agriculture. Research to improve P-efficiency includes:

- (1) Elucidation of the genetic basis of P-efficiency (uptake and utilization efficiency)
- (2) Unlocking the accumulated but not available or not used P-stores in topsoil and the subsoil
- (3) Utilization of alternative P sources and development / refinement of practice-relevant P-recovery technologies including research into the properties and potential of alternative P sources and technically recovered phosphates and extending to recommendations for practical applications.

The interdisciplinary nature of the Cluster, which covers all sub-areas of the agricultural P cycle (soil, plant, animal, water, process engineering ...), enables a realistic assessment of the portion of the P application rates that in the future are replaceable with renewable P sources.

3.1.3 Cluster III: Syntheses of and with phosphorus-containing compounds

This cluster is primarily concerned with research into underlying structural and reactive properties as well as theoretical issues in phosphorus chemistry. This reflects the formally possible oxidation states, which for phosphorus range from -3 to $+5$, the extraordinarily high structural diversity of phosphorus compounds. As a central element in achiral and chiral ligands for organometallic and coordination chemistry catalytic processes, phosphorus plays a unique role in catalysis research and as a reagent in organic syntheses. This is also true for some areas of industrial chemistry, mainly in the manufacture of fine chemicals, which often have a high added value. In addition, phosphorus-based organo-catalysts are gaining increasing importance.

3.1.4 Cross-cutting activity: The development of improved P analysis methods

The cross-cutting activity (Cluster: Q) has as its focus on the provision and development of diverse methods needed for carrying out the main areas of research of the entire Phosphorus Campus. On the other hand, it is the objective of this Cluster to approach the question of relevant phosphorus compounds in the environment and their dynamics through its own projects. The spectrum of available methods includes the most modern chemical analytical methods, such as coupled gas (GC-MS) and liquid chromatography (HPLC-MS/MS) and colourimetric methods. In addition, at the IOW, with its CAMECA NanoSIMS 50L, a secondary ion mass spectrometer is available with which the elementary and isotopic composition of the smallest particles and single cells can be investigated. P metabolism by microorganisms from the Baltic Sea and soil have already been analyzed here and the presence of P-storage vacuoles in cyanobacteria depicted.

3.2 Research projects

Within the research clusters, 36 disciplinary and interdisciplinary, externally funded projects were thematically assigned to the ScienceCampus Rostock in 2017. Ten of these projects started newly in 2017 and one project (CRUSTFUNCTION) was approved for the second phase. The graduate school Phosphorus research, funded by the Leibniz Association, conducts research in 11 thematically affiliated individual projects, which are listed in table 2. Additionally, nine seed projects - applied by projects partners from Leibniz institutes together with partners of the University of Rostock and funded by the LWC - started in 2017 (Table 3).

Table 1: Research projects thematically assigned to the ScienceCampus Rostock (status as of December 2017; italics: phosphorus not a subject of the total project or members of the LWC only in parts of the project activ)

Project name	Term	Sponsor	Participating Partners of the ScienceCampus	Cluster
Anschubprojekte im Rahmen der Förderung des Leibniz-WissenschaftsCampus Phosphorforschung Rostock	04/2017-12/2018	WGL	FBN, IOW, INP, IPK, LI-KAT, Universität Rostock	I, II, III, Q
<i>BACOSA II: Baltic Coastal System Analysis and Status Evaluation</i>	<i>04/2016 - 03/2019</i>	<i>BMBF</i>	<i>Universität Rostock (MNF, AUF)</i>	<i>I</i>

<i>BaltCoast: A Systems Approach Framework for Coastal Research and Management in the Baltic</i>	04/2015-03/2018	EU-Bonus	IOW (Biologische Meereskunde)	I
<i>Baltic TRANSCOAST: Baltic TRANSCOAST</i>	01/2016-06/2020	DFG	Universität Rostock (AUF, MNF), IOW	I
<i>BioAcid III: Biological Impacts of Ocean Acidification</i>	10/2015-09/2017	BMBF	Universität Rostock, IOW	I
Biomasse-Asche-Monitoring (BAM): Teilvorhaben 2: Agronomische Bewertung	11/2016-10/2019	BMELV	Universität Rostock (AUF)	II
BMP-Glyphosat: Best Management-Praktiken und Nachhaltige Anwendung von Glyphosatprodukten	10/2013-05/2017	BLE; über BMEL, Innovationsprogramm	Universität Rostock (AUF)	II
<i>CLIMARCTIC: Einfluss des Klimawandels auf arktische Boden- und See-Mikrobiome</i>	03/2017 - 02/2020	DFG	Universität Rostock (MNF)	I
<i>CRUSTFUNCTION II: Biodiversität und funktionelle Rolle von biologischen Bodenkrusten II</i>	07/2017-06/2020	DFG	Universität Rostock (MNF, AUF)	I
<i>CRUSTFUNCTION: Biodiversität und ökologische Funktion von biologischen Bodenkrusten</i>	07/2014-06/2017	DFG SPP	Universität Rostock, (AUF, MNF)	I
<i>CRUSTWEATHERING: Structure and function of biocrusts in weathering, soil formation and erosion processes</i>	01/2016-12/2018	DFG	Universität Rostock (AUF, MNF)	I, II
<i>DachKüNO II: Wissens- und Datentransfer in der Küstenmeerforschung</i>	01/2017-12/2019	BMBF	IOW	I
<i>Durchführung einer Studie zu den Perspektiven für die deutsche Aquakultur im internationalen Wettbewerb</i>	2016-2017	BLE	Universität Rostock	II
<i>ECO-FCE: A whole-systems approach to optimising feed efficiency and reducing the ecological footprint of monogastrics</i>	12/13-01/17	EU-FP7	FBN (Genom-biologie)	II
<i>Ernährung für Gesundheit: Fischfuttermittelinduzierte Qualitätssteigerung von Fisch- und Pflanzenprodukten aus Aquaponiksystemen in MV</i>	11/2015-10/2018	EU	Universität Rostock (AUF)	II
Glyphosat: Untersuchungen der Eigenschaften und Wirkungsweisen von Glyphosat im Boden	2016-2019	Landesgraduiertenstipendium MV	Universität Rostock	I, II, Q
Graduiertenschule: Leibniz-WissenschaftsCampus Phosphorforschung Rostock	04/15-03/19	WGL	FBN, IOW, INP, IPK, LI-KAT, Universität Rostock	I, II, III, Q
<i>InnoAquaTech: Cross-border development and transfer of innovative and sustainable aquaculture technologies in the South Baltic area</i>	07/2016-06/2019	Interreg South Baltic	Universität Rostock (AUF)	II
InnoSoilPhos: Innovative solutions to sustainable soil phosphorus management	03/2015-02/2018	BMBF	Universität Rostock (AUF)	I, II, Q

<i>INTEGRAL: Integrated carbon and trace gas monitoring for the Baltic Sea</i>	07/2017-06/2020	BONUS	IOW	I
<i>KataPlasma: Hydroformylierung mit homogenen Katalysatoren geträgert auf Plasma funktionalisierten Materialien</i>	06/2016 – 05/2019	BMBF	LIKAT, INP	III
<i>Kogge: Kommunale Gewässer gemeinschaftlich entwickeln im urbanen Raum</i>	2015-09/2018	BMBF	Universität Rostock (AUF)	I
<i>Mephor: Cellular mechanisms of phosphorus regulation in filamentous cyanobacteria</i>	05/2015-04/2018	Forschungsstiftung Ostsee	IOW (Biologische Meereskunde)	I
<i>MOSSCO II: Modular System for Shelves and Coasts</i>	04/2016-03/2019	BMBF	IOW	I
<i>NuReDrain: Innovative Nutrient Catching Reactive Barrier and Controlled Drainage Technologies for Sustainable Growth of the Agriculture Sector</i>	2017-2020	North Sea Region Programme (EU)	Universität Rostock (AUF)	I, II
<i>OPTIMUS: Optimierung von Muschelfarmen zur Eutrophierungsvermeidung und zur Fischfutterproduktion in der Ostsee</i>	04/2017-03/2020	BONUS	IOW	I
<i>P FOWL: Inositolphosphate und Myo-Inositol beim Geflügel</i>	09/2017-08/2020	DFG	FBN	II
<i>PEGaSus: Phosphorus efficiency in Gallus and Sus scrofa: Bridging the gaps in the phosphorus value chain</i>	09/2017-08/2020	ERA-NET SUSAN	FBN	I, II
<i>Phosphor-Deposition: Entwicklung ausgewählter Indikatoren und Bewertungssätze für die Meeresumwelt im Rahmen der Umsetzung der Meeresstrategie-Rahmenrichtlinie</i>	09/2015-06/2018	Umweltbundesamt	IOW (Meereschemie)	I, Q
<i>PhosWaM: Phosphor von der Quelle bis ins Meer - Integriertes Phosphor- und Wasserressourcenmanagement für nachhaltigen Gewässerschutz</i>	03/2016-02/2019	BMBF	IOW, Universität Rostock	I, II
<i>POLARCRUST: Biological soil crust algae in polar regions</i>	2014-2017	DFG	Universität Rostock (MNF)	I
<i>PRODIVA: Crop diversification and weed management</i>	03/2015-02/2018	ERA-net Core Organic Plus	Universität Rostock (AUF)	II
<i>Scientific Resurvey of the wet grassland restoration project „Osterfeiner Moor“</i>	09/2016-08/2018	BfN	Universität Rostock (AUF)	II
<i>SECOS: The Service of Sediments in German Coastal Seas</i>	04/2016-03/2019	BMBF	IOW	I
<i>SPP1685: Untersuchungen zum Verständnis des Phosphorzyklus in Wald-Ökosystemen auf molekularer Ebene</i>	11/2016-10/2019	DFG	Uni Rostock (MNF)	I, II
<i>WETSCAPES: Stoffumsetzungsprozesse an Moor- und Küstenstandorten als Grundlage für Landnutzung, Klimawirkung und Gewässerschutz</i>	01/2017-12/2020	Europäischer Sozialfond	Universität Rostock (AUF)	I, II, Q

Table 2: Subprojects of the Graduate School Phosphorus Research Rostock (financed by the Leibniz Association and partners of the ScienceCampus Rostock): 2015–2018

Project	Participating Partners of the ScienceCampus	Research focus
Quality, quantity and transformation of P losses from diffuse sources to the Baltic Sea	IOW, Universität Rostock	I
Phosphatases – Development of new quantitative assays along terrestrial-aquatic gradients	Universität Rostock, IOW	I
Natural and anthropogenic organic P compounds – inositol-phosphates, phospholipids and glyphosate	IOW, Universität Rostock	I, II, Q
Mechanisms of P mobilization in the rhizosphere involving weeds and crop plants	Universität Rostock, IPK	II
Genetic regulation of phosphatase production and activity to increase P uptake from deficient soils	Universität Rostock, IPK	II
Genetic and nutritional effects on the efficiency of P use of monogastric animals	FBN, Universität Rostock	II
The P cycle and its application in land-based integrated aquaculture systems	Universität Rostock, FBN	II
Political-legal P governance by means of certificate markets and charges	Universität Rostock, IOW	II
Processing of alternative P sources for fertilization in agriculture	INP, Universität Rostock	II, III
Synthesis of new heterocyclic ring systems containing P	LIKAT, Universität Rostock	III
Large scale application of P based organocatalysts in batch and flow for the synthesis of fatty acid derived cyclic carbonates	LIKAT, Universität Rostock	III

Table 3: In 2017 9 Seed projects started in cooperation between partners of the ScienceCampus Rostock (condensed reports of the projects can be provided on request).

Projekt	Beteiligte Partner
The role of reversible phosphorylation in regulation of mitochondrial bioenergetics (MitoP)	UoR, FBN
Unraveling molecular signaling pathways involved in phosphorus acquisition of potato (PIPAPo)	UoR, IPK
P-Recycling in the context of farm animal husbandry	UoR, IOW
Evaluation of novel P-based organocatalysts in the activation of small molecules and P(III)/P(V)-redox catalysis (P-Aktiv)	LIKAT, UoR
Immobilization of P-based organocatalysts by plasma techniques (H-POP)	LIKAT, UoR
Desalting of marine water through electrodialysis	IOW, UoR
31-P-NMR Spectroscopy: method improvements and applications to P compounds and -fluxes in the environment (P-NMR)	UoR, LIKAT; IOW
Evaluation of different P-digestion methods for diverse environmental materials (EvaPhoN II)	UoR, IOW
Abtrennung von organischen Phosphaten durch Kristallisation (CrysPhos)	UoR, LIKAT

3.3 Graduate Concept/Graduate School Phosphorus Research

The structured training concept of the ScienceCampus Rostock (see Figure 1) is realized by graduate studies at the Graduate School of Phosphorus Research and the involvement of other young scientists (BSc and MSc students, doctoral students, and postdocs) whose thesis or project concerns phosphorus research. All relevant information is provided to young scientific members of the ScienceCampus. In addition to their inclusion in events

involving the ScienceCampus Rostock and in scientific and thematic networks, for example, those of the DPP and ESPP, they can apply to the Campus for grants and for financial support for internationalization (travel, publications, and visiting scientists, including longer stays).

Graduate Concept		
Postdocs	PhD / <u>Phosphorus Graduate School</u>	MSc/BSc
	Thematic training/study programme	
	Soft skills incl. knowledge transfer	
	Internationalisation & Networking	

Figure 1: Graduate concept of the Leibniz ScienceCampus Phosphorus Research Rostock

The Graduate School of Phosphorus Research is the core of the graduate concept of the ScienceCampus Rostock. Its overall objective is to provide excellent graduate education, to encourage new and innovative phosphorus research topics, and to foster networking among partners. The 11 currently ongoing doctoral projects cover important areas of knowledge and research (Table 2). BSc and MSc thesis topics in phosphorus research have also been developed.

All doctoral students are supervised by a committee of scientists from at least two partner organizations of the ScienceCampus (e.g., the Leibniz Institute for Baltic Sea Research and the University of Rostock). In 2016, the students presented their work at the annual ScienceCampus Rostock Symposium, held in March, and at the IPW8. Lively exchanges of information between doctoral students are promoted through various events, such as workshops and the regularly held "Phosphorus Breakfast" (see Section 5). Positive support for these activities has come from opening up the events to other doctoral students with thesis topics in phosphorus-related research.

3.4 Publications

Publications of the members of the ScienceCampus Rostock in 2017:

Bachmann-Pfabe, S.; Zicker, T.; Fiedler, S.; Eichler-Löbermann, B. (2017): So bewerten Sie Gärreste. DLG-Mitteilungen 10/2017, 52-54.

Bachmann-Pfabe, S.; Zicker, T.; Fiedler, S.; Eichler-Löbermann, B. (2017): Düngewirkung von Gärresten unter besonderer Berücksichtigung des Elements Phosphor. In: Biogas in der Landwirtschaft, KTBL-Schrift 512, 250 – 257, ISBN: 978-3-94-5088-52-4.

Bathmann, U. and Krämer, I. (2017): Leibniz ScienceCampus Phosphorus Research Rostock: Towards sustainable phosphorus management. In: Living along gradients: past, present, future. The 11th Baltic Sea Science Congress, Rostock, June 12-16, 2017 : Abstracts. Leibniz Institute for Baltic Sea Research (IOW): 301.

- Baumann, K.; Glaser, K.; Mutz, J.-E.; Karsten, U.; MacLennan, A.; Hu, Y.; Michalik, D.; Kruse, J.; Eckhardt, K.-U.; Schall, P.; Leinweber, P. (2017): Biological soil crusts of temperate forests: Their role in P cycling. *Soil Biology and Biochemistry* 109: 15-166.
- Berthold, M., Karsten, U., von Weber, M., Albrecht, M., and Schumann, R. (2017): Is there a way back? Possible development of coastal water bodies during re-mesotrophication. In: *Living along gradients: past, present, future. The 11th Baltic Sea Science Congress, Rostock, June 12-16, 2017 : Abstracts. Leibniz Institute for Baltic Sea Research (IOW): 125.*
- Bitschofsky, F., Nausch, M., Felgentreu, L., and Jahn, S. (2017): Phosphorus composition along the river Warnow and its catchment - preliminary results. In: *Living along gradients: past, present, future. The 11th Baltic Sea Science Congress, Rostock, June 12-16, 2017 : Abstracts. Leibniz Institute for Baltic Sea Research (IOW): 305.*
- Bitschofsky, F. (2017): How much phosphorus is in the sediments of the Darß-Zingst Bodden Chain (DZBC)? - Meaning of physical sediment properties. In: *Living along gradients: past, present, future. The 11th Baltic Sea Science Congress, Rostock, June 12-16, 2017 : Abstracts. Leibniz Institute for Baltic Sea Research (IOW): 304.*
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3.5 Theses

Bitschofsky, F. (2017): Phosphorus dynamics in sediments of Darß-Zingst Bodden Chain, an eutrophic estuary in the southern Baltic Sea. Dissertation an der Universität Rostock. Betreuer: PD Dr. Stefan Forster

Büttner, H. (2017): Organokatalytische Synthese zyklischer Carbonate aus CO₂ und Epoxid. Dissertation an der Universität Rostock. Betreuer: Prof. Dr. Matthias Beller (Leibniz-Institut für Katalyse e.V.)

Karstens, S. (2017): Ecosystem services in coastal Phragmites wetlands at the southern Baltic Sea: nutrient regulation, water purification and erosion control. Dissertation an der Universität Rostock Betreuer: Prof. Dr. Stephan Glatzel (Universität Wien)

Kavka, M. (2017): Phosphorus nutrition of poplar. Dissertation an der Georg-August-Universität Göttingen. Betreuer: Prof. Dr. Andrea Polle (Universität Göttingen)

4 Networking

Besides interactions among its individual scientists and research groups, the ScienceCampus Rostock is a member of the ESPP and DPP. In addition, the ScienceCampus Rostock is connected with other Leibniz ScienceCampi as well as through its scientists and their thematic networks.

Deutsche Phosphor Plattform (DPP) – Participation in general assembly (11.09.2017; Prof. P. Leinweber) and annual forum (12.09.2017, Prof. P. Leinweber, Dr. I. Krämer) in Berlin. Prof. P. Leinweber was re-elected as a member of the board of the DPP.

Networking meeting of the coordinators of the Leibniz-ScienceCampi, Berlin, 29.11.2017 (Prof. U. Bathmann as substitute for Dr. I. Krämer)

European Sustainable Phosphorus Platform (ESPP) Stakeholder Meeting "Recycled nutrients in organic farming", 12.12.2017, Brüssel (Jessica Stubenrauch)

5 Events

Different kind of events were held, e.g. to promote networking and interdisciplinary cooperation within the ScienceCampus Rostock but also with external scientists, authorities, and the general public. Events are listed in the following.

5.1 Public events

Lecture series Phosphorus Research „Interdisziplinäre Herangehensweise an ein lebenswichtiges Element“: WS16/17 with 9 presentations at the University of Rostock by members of the ScienceCampus Rostock and four guest lecturers (program attached in the Appendix)

International Symposium of the Leibniz ScienceCampus Phosphorus Research Rostock (IOW, Warnemünde), 08.-09.11.2017

Workshop Niederschlagsabwasser auf Biogasanlagen (Rainfall waste water at biogas plants). Rampe near Schwerin, 13.10.2017. Joint event of the Ministry of Agriculture and Environment MV and the professorship water management (University of Rostock) and Rotaria GmbH.

Within the lecture series AGRICOAST „Nachhaltige Ressourcennutzung in küstennahen Agrarlandschaften“ (Sustainable resource usage in coastal agricultural landscape) (06.11.2017, Universität Rostock): Prof. Dr. N. Wrage-Mönnig (University of Rostock) „WETSCAPES – Vom Verstehen zur nachhaltigen Nutzung unserer Moore“ (WETSCAPES – From understanding to sustainable usage of fen)

5.2 Internal meetings and workshops

Internal meetings and workshops facilitate intensive networking and thematic exchanges between scientists of the ScienceCampus. In addition to various events for graduate/doctoral students, an annual campus-symposium is held in which all scientists introduce their new projects, present their work, and discuss the results. The Steering Group of the ScienceCampus meets roughly every 3 months to discuss overarching issues as well as the strategic orientation and further development of the ScienceCampus.

Symposium of the Leibniz-ScienceCampus Phosphorus Research Rostock, Department „Life, Light & Matter“ of the University of Rostock, 06. & 07.04.2017

Meetings of the steering group of the ScienceCampus: 30.01., 03.04., 06.10., 05.07., 08.12. (at different partner institutes)

To promote exchanges among PhD students working on phosphorus-related issues within the ScienceCampus Rostock, two “Phosphorus Breakfast” gatherings took place at different partner institutes, during which phosphorus research and related updates were presented and discussed: 03.02.2017 (LIKAT, Rostock), 12.05.2017 (FBN, Dummerstorf), 13.10.2017 (IOW Warnemünde)

Editor meetings for the AMBIO special issue: 01.02.2017 & 29.05.2017 (University of Rostock)

6 Public relations

The ScienceCampus Rostock and the research of its members have been introduced to external research groups, politicians, government, and the general public. A selection of the related events is provided below.

6.1 Oral presentations (selection)

- Bathmann, U.: Ist die Ostsee im Stress? Vortrag im Rahmen der Seniorenakademie der Universität Rostock, 05.04.2017
- Baum, C.; Eckhardt, K.-U.; Prüfer, D.; Eickmeyer, F.; Leinweber P.: Intraspecific diversity of the rhizodeposition of *Lupinus angustifolius* L. regarding the phosphorus mobilization in the soil. Jahrestagung der Deutschen Bodenkundlichen Gesellschaft. 02.-07.09.2017, Göttingen
- Baumann, K.; Glaser, K.; Karsten, U.; Eckhardt, K.-U.; Leinweber P.: Die Rolle biologischer Bodenkrusten im C-, N- und P-Kreislauf. Jahrestagung der Deutschen Bodenkundlichen Gesellschaft. 02.-07.09.2017, Göttingen
- Braun, P.; Vogts, A.; Schulz-Vogt, H.; Nausch, M.: Dynamic of polyphosphate accumulation in the cyanobacterium *nodularia spumigena*. Aquatic Science Meeting 2017 der „Association of the Sciences of Limnology & Oceanography (ASLO)“, 26.02.-03.03.2017, Honolulu, Hawaii
- Görs, M.; Baum, C.; Grafe, M.; Schulz, S.; Schloter, M.; Leinweber, P.: Long-term impact of different fertilization management on microbial P mobilization and community structure in the bulk soil and rhizosphere of maize. Jahrestagung der Deutschen Bodenkundlichen Gesellschaft. 02.-07.09.2017, Göttingen
- Gros, P.; Ahmed, A.A.; Kühn, O.; Leinweber, P.: Neue Erkenntnisse zum Bindungsverhalten von Glyphosat im Boden durch Sorptionsexperimente und quantenchemische Modellierung. Jahrestagung der Deutschen Bodenkundlichen Gesellschaft. 02.-07.09.2017, Göttingen
- Palm, H.; Wasenitz, B.; Knaus, U.; Bischoff, A.; Strauch, S.: Two years of aquaponics research in the fishglashouse – lessons learned. Aquaculture Europe 2017, 17.-20.10.2017, Dubrovnik, Kroatien
- Strauch, S.: Nutrient dynamics in aquaponics with African Catfish and Moroccan mint. EU aquaponics HUB, 18.-20.4.2017, Murcia, Spanien
- Stubenrauch, J.; Douhaire, C.: Völker- und europarechtliche Zielvorgaben zu einschlägigen Umweltproblemen. Tagung „Nachhaltige Landwirtschaft und die Zukunft tierischer Nahrungsmittel“ an der Ev. Akademie Wittenberg, 22.04.2017
- Zacher, A.; Gerowitt, B.; de Mol, F.; Dehmer, K. J.; Baum, C.: Potentielle Wirkung von Unkräutern auf die P-Mobilisierung unter Mais. Jahrestagung der Deutschen Bodenkundlichen Gesellschaft. 02.-07.09.2017, Göttingen
- Zimmer, D.; Panten, K.; Leinweber P.: Bewertung (oberflächenmodifizierter) Knochenkohle als alternativer P-Dünger durch spektroskopische und nasschemische Analysen kombiniert mit Gefäß- und Feldversuchen. Jahrestagung der Deutschen Bodenkundlichen Gesellschaft. 02.-07.09.2017, Göttingen

6.2 Posters (selection)

- Bathmann, U. and Krämer, I. (2017): Leibniz ScienceCampus Phosphorus Research Rostock: Towards sustainable phosphorus management. The 11th Baltic Sea Science Congress, Rostock, June 12-16, 2017

- Berthold, M., Karsten, U., von Weber, M., Albrecht, M., and Schumann, R. (2017): Is there a way back? Possible development of coastal water bodies during re-mesotrophication. The 11th Baltic Sea Science Congress, Rostock, June 12-16, 2017
- Bitschofsky, F., Nausch, M., Felgentreu, L., and Jahn, S. (2017): Phosphorus composition along the river Warnow and its catchment - preliminary results. The 11th Baltic Sea Science Congress, Rostock, June 12-16, 2017
- Bitschofsky, F. (2017): How much phosphorus is in the sediments of the Darß-Zingst Bodden Chain (DZBC)? - Meaning of physical sediment properties. The 11th Baltic Sea Science Congress, Rostock, June 12-16, 2017
- Braun, P., Schulz-Vogt, H., Siebers, M., Dörmann, P., and Nausch, M. (2017): Cellular mechanisms of phosphorus regulation in filamentous cyanobacteria. The 11th Baltic Sea Science Congress, Rostock, June 12-16, 2017
- Deutsch, B., Böx, S., Rodd, M., Tränckner, J., Mehl, D. (2017): Retention and release of phosphorus from lake and river sediments in the Warnow river catchment (Baltic Sea) during different seasons. The 11th Baltic Sea Science Congress, Rostock, June 12-16, 2017
- Felgentreu, L., Nausch, G., Leipe, T., Dellwig, O., Schulz-Bull, D. (2017): Phosphorus cycling in the Warnow estuary: concentrations, transformation, retention and bio-availability. The 11th Baltic Sea Science Congress, Rostock, June 12-16, 2017
- Friedland, R., Buer, A.-L., Dahlke, S., Fritsche, B., Inacio, M., Paysen, S., Schernewski, G., Schumacher, J., and Stybel, N. (2017): Nutrient retention measure in German Baltic Sea waters – potentials and limits of some eco-technologies. The 11th Baltic Sea Science Congress, Rostock, June 12-16, 2017
- Friedland, R., Buer, A.-L., Dahlke, S., Holtermann, P., Klingbeil, K., Lemmen, C., Meyers, L., Schernewski, G., Stybel, N. (2017): Modelling the impact of a mussel farm on the water quality. The 11th Baltic Sea Science Congress, Rostock, June 12-16, 2017
- Gogina, M., Lipka, M., Woelfel, J., Liu, B., Böttcher, M. E., Zettler, M. L. (2017): Who or what shapes the gradients in pore-water profiles? On the hunt for an explanation of the impact of benthic macrofauna on biogeochemistry and benthic-pelagic element coupling. The 11th Baltic Sea Science Congress, Rostock, June 12-16, 2017
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6.3 Press

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- Phosphorrückgewinnung ist zwingend, article on schweizerbauer.ch, 13.11.2017
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6.4 Websites

- Leibniz-WissenschaftsCampus Phosphorforschung Rostock: www.wissenschaftscampus-rostock.de (www.sciencecampus-rostock.de; www.p-campus-rostock.de)
- Leibniz-Association/ScienceCampi: <https://www.leibniz-gemeinschaft.de/en/research/leibniz-sciencecampi/phosphorous-research/>

6.5 Others

Long night of science, University of Rostock, 27.04.2017. Information point & presentation of the Leibniz-ScienceCampus Phosphorus Research Rostock. Peter Gros, Inga Krämer, Katrin Wacker, Anika Zacher.

7 Structure and committees

7.1 Structure

The ScienceCampus Phosphorus Research Rostock is assigned to the University of Rostock's Interdisciplinary Faculty (INF), Department of Maritime Systems.

The organisation of the ScienceCampus Phosphorus Research Rostock is as follows: The **Directorship** is made up of the Directors of the participating Leibniz Institutes and the Rector of the University of Rostock. They can be represented by members of their institutions. Through the **Steering Committee** representatives of the Leibniz Institutes and the University of Rostock assume direct leadership of the ScienceCampus. They are represented by a **Spokesperson**. Direct **coordination** is carried out by a staff scientist, supported by a secretary. An international **Scientific Advisory Council** oversees the ScienceCampus Phosphorus Research and in addition to advising has the task of evaluating the scientific work of the ScienceCampus. Currently, more than 70 scientists and 12 PhD students from 45 Working Groups are **Members** (see Partners and Members) of the ScienceCampus Rostock.

The Institute for Baltic Sea Research Warnemünde acts as beneficiaries and provides the coordination office.



Fig.2: Structure of the ScienceCampus Rostock

7.2 Committes

7.2.1 Scientific Advisory Council

Prof. Dr. Emmanuel Frossard, ETH Zürich
 Prof. Dr. Ellery D. Ingall, Georgia Institute of Technology
 Prof. Dr. Christian Müller, FU Berlin
 Prof. Dr. Hisao Ohtake, Osaka University Japan
 Prof. Dr. Paul Withers, Prifysgol, Bangor University/UK

7.2.2 Directorship

Prof. Dr. Ulrich Bathmann, IOW
 Prof. Dr. Matthias Beller, LIKAT
 Prof. Dr. Andreas Graner, IPK
 Prof. Dr. Wolfgang Schareck, UoR
 Prof. Dr. Klaus-Dieter Weltmann, INP
 Prof. Dr. Klaus Wimmers, FBN

7.2.3 Spokesperson / Deputy

Prof. Dr. Ulrich Bathmann, IOW
 Prof. Dr. Peter Leinweber, University of Rostock (spokesperson of the university)

7.2.4 Steering committee

Dr. Marion Abraham, IOW since 07/2017
 Prof. Dr. Ulrich Bathmann, IOW
 Dr. Volker Brüser, INP
 Dr. Klaus Dehmer, IPK
 Prof. Dr. Ulf Karsten, University of Rostock
 Dr. Inga Krämer, ScienceCampus
 Prof. Dr. Udo Kragl, University of Rostock
 Prof. Dr. Peter Leinweber, University of Rostock (spokesperson of the university)
 Prof. Dr. Detlef Schulz-Bull, IOW until 06/2017
 Dr. Thomas Werner, LIKAT
 Prof. Dr. Klaus Wimmers, FBN

Substitutes:

Dr. Silvia Bachmann-Pfabe, IPK since 04/2017
 PD Dr. Tom Goldammer, FBN
 Prof. Dr. Marko Hapke, LIKAT
 Dr. Stephan Reuter, INP
 Prof. Dr. Axel Schulz, University of Rostock/LIKAT
 Evelin Willner, IPK until 03/2017

7.2.5 Coordination office

(Work and tasks 2017: see Appendix)
 Dr. Inga Krämer
 Daniela Derlet-Eichler (Secretary)

7.2.6 Members

(Status: Updated during 2017)

Leibniz Institute for Catalysis (LIKAT) at the University of Rostock

Prof. Dr. Matthias Beller	Applied Homogeneous Catalysis	Cluster III
Prof. Dr. Armin Börner	Asymmetric Catalysis	Cluster III
Hendrik Büttner	Organocatalysis	Cluster III
Dr. Marko Hapke	Cycloadditions and Transition Metal Catalysis	Cluster III

Dr. Christian Hering-Junghans	Small Molecule Activation	Cluster III
Yuya Hu	Organocatalysis	Cluster III
Lars Longwitz	Organocatalysis	Cluster III
Dr. Dirk Michalik	Analytical Service	Cluster III
Prof. Dr. Uwe Rosenthal	Coordination Chemistry and Catalysis	Cluster III
Johannes Steinbauer	Organocatalysis	Cluster III
Dr. Thomas Werner	Organocatalysis	Cluster III

Leibniz Institute for Farm Animal Biology (FBN), Dummerstorf

Christian Gerlinger	Genome Biology	Cluster II
PD Dr. Tom Goldammer	Genome Biology	Cluster II
Franziska Just	Genome Biology	Cluster II
Dr. Michael Oster	Genome Biology	Cluster II
Prof. Dr. Klaus Wimmers	Genome Biology / Director	Cluster II

Leibniz-Institut für Ostseeforschung Warnemünde (IOW)

Directorate

Prof. Dr. Ulrich Bathmann	Director	Cluster I
Dr. Inga Krämer	Coordination Office	

Department Biological Oceanography

Franziska Bitschofsky	Microbial Processes and Phosphorus Cycle	Cluster I
Philipp Braun	Microbial Processes and Phosphorus Cycle	Cluster I
Sandra Jahn	Microbial Processes and Phosphorus Cycle	Cluster I
Dr. Monika Nausch	Microbial Processes and Phosphorus Cycle	Cluster I
Dr. Angela Vogts	NanoSIMS Lab	Q

Department Marine Geology

Prof. Dr. Michael Böttcher	Geochemistry and Stable Isotope Biogeochemistry	Cluster I, Q
Dr. Thomas Leipe	Microanalysis	Cluster I, Q
Marko Lipka	Geochemistry and Stable Isotope Biogeochemistry	Cluster I, Q

Department Marine Chemistry

Dr. Marion Abraham	Organic Contaminants	Cluster I, Q
Lisa Felgentreu	General Marine Chemistry	Cluster I, Q
Dr. Günther Nausch	General Marine Chemistry	Cluster I, Q
Constantin Recknagel	Organic Contaminants	Cluster I, Q
Dr. Oliver Schmale	Biogeochemistry Trace Gases	Cluster I, Q
Prof. Dr. Detlef Schulz-Bull	Organic Contaminants	Cluster I, Q
Dr. Wael Skeff	Organic Contaminants	Cluster I, Q
Marisa Wirth	Organic Contaminants	Cluster I, Q

Department Physical Oceanography and Instrumentation

Dr. René Friedland	Baltic Sea system dynamics	Cluster I
Dr. Daniel Neumann	Marine biogeochemical modeling	Cluster I
Dr. Thomas Neumann	Baltic Sea system dynamics	Cluster I

Dr. Hagen Radtke Baltic Sea system dynamics Cluster I

Leibniz Institute for Plant Genetics and Crop Plant Research (IPK), Satellite Collections North, Groß Lüsewitz

Dr. Silvia Bachmann-Pfabe Genebank, Satellite Collections North Cluster II
 Dr. Klaus Dehmer Genebank, Satellite Collections North Cluster II
 Prof. Dr. Andreas Graner Director Cluster II
 Evelin Willner Genebank, Satellite Collections North Cluster II

Leibniz Institute for Plasma Research and Technology (INP), Greifswald

Dr. Volker Brüser Catalytic Materials Cluster II
 Sina Jahanbakhsh Catalytic Materials Cluster II
 Dr. Stephan Reuter Plasma Medicine/Decontamination Cluster II
 Prof. Dr. Klaus-Dieter Weltmann Director

University of Rostock

Faculty of Agricultural and Environmental Sciences

PD Dr. Christel Baum Soil Science Cluster II
 Dr. Karen Baumann Soil Science Cluster II
 Dr. Adrian Bischoff-Lang Aquaculture and Sea-Ranching Cluster I, II
 Dr. Luisa Borgelt Nutrient Physiology and Animal Nutrition Cluster II
 Dr. Uwe Buczko Landscape Ecology and Site Evaluation Cluster I
 Dr. Jörg Burgstaler Agricultural Technology and Process Engineering Cluster II
 Michael Cramer Water Resources Management Cluster II
 apl. Prof. Dr. Bettina Eichler-Löbermann Agronomy Cluster II
 Beatrice Garske Research Unit Sustainability and Climate Policy Cluster II
 Prof. Dr. Bärbel Gerowitt Crop Health Cluster II
 Dr. Manuela Görs Soil Science Cluster II
 Theresa Zicker (nee Gropp) Agronomy Cluster II
 Peter Gros Soil Science Cluster II
 Jennifer Grünes Waste Management and Material Flow Cluster II
 Dr. Petra Kahle Soil Physics Cluster I, II
 Dr. Mareike Kavka Agronomy
 Prof. Dr. Norbert Kanswohl Agricultural Technology and Process Engineering Cluster II
 Svenja Karstens Landscape Ecology and Site Evaluation Cluster I
 Dipl. Agr.-Ing. Ulrich Knaus Aquaculture and Sea-Ranching Cluster I, II
 Stefan Koch Soil Physics Cluster I
 Prof. Dr. Peter Leinweber Soil Science Cluster II,Q
 Prof. Dr. Bernd Lennartz Soil Physics Cluster I, II
 Barbara Mahnke Grassland and Fodder Sciences Cluster I

Dr. Gert Morscheck	Waste Management and Material Flow	Cluster II
Mohsen Morshedizad	Soil Science	Cluster II
Dr. Jürgen Müller	Landscape Ecology and Site Evaluation	Cluster I
Prof. Dr. Michael Nelles	Waste Management and Material Flow	Cluster II
Prof. Dr. Harry Palm	Aquaculture and Sea-Ranching	Cluster I, II
Sebastian Strauch	Aquaculture and Sea-Ranching	Cluster I, II
Jessica Stubenrauch	Research Unit Sustainability and Climate Policy	Cluster II
Prof. Dr. Jens Tränckner	Water Resources Management	Cluster II
Prof. Dr. Ralf Uptmoor	Agronomy	Cluster II
Michael van Laak	Landscape Ecology and Site Evaluation	Cluster II
Telse Vogel	Agronomy	Cluster II
Kathrin Wacker	Agronomy	Cluster II
Jutta Wieding	Research Unit Sustainability and Climate Policy	Cluster II
Dr. Denny Wiedow	Agricultural Technology and Process Engineering	Cluster II
Prof. Dr. Petra Wolf	Nutrient Physiology and Animal Nutrition	Cluster II
Prof. Dr. Nicole Wrage-Mönnig	Grassland and Fodder Sciences	Cluster II
Annika Zacher	Soil Science	Cluster II
Dr. Dana Zimmer	Soil Science	Cluster II
<u>Faculty of Law</u>		
Caroline Douhaire	Research Unit Sustainability and Climate Policy	Cluster II
Prof. Felix Ekardt	Research Unit Sustainability and Climate Policy	Cluster II
<u>Faculty of Mathematics and Natural Sciences</u>		
Dr. Ashour Ahmed	Institute of Physics, Molecular Quantum Dynamics	Cluster Q
Maximilian Berthold	Institute for Biological Sciences, Applied Ecology & Phycology	Cluster I, Q
Dr. Jonas Bresien	Institute for Chemistry, Anorganic Chemistry	Cluster III
PD Dr. Stefan Forster	Institute for Biological Sciences, Marine Biology	Cluster I
Prof. Ulf Karsten	Institute for Biological Sciences, Applied Ecology & Phycology	Cluster I, II
Prof. Udo Kragl	Institute for Chemistry, Analytical & Technical Chemistry; Technical Chemistry	Cluster III
Prof. Oliver Kühn	Institute of Physics, Molecular Quantum Dynamics	Q
Iris Schaub	Institute for Biological Sciences, Applied Ecology & Phycology	Cluster I
Prof. Dr. Axel Schulz	Institute for Chemistry, Anorganic Chemistry	Cluster III
PD Dr. Rhenia Schumann	Institute for Biological Sciences, Applied Ecology & Phycology, Biological Station Zingst	Cluster I, Q
Prof. Dr. Inna Sokolova	Marine Biology	Cluster II
Dr. Jan von Langermann	Institute for Chemistry, Biocatalysis	Cluster III
<u>Rostock University Medical Center</u>		

PD Dr. Hugo Murua Escobar	Hematology, oncology and palliative care	Cluster III
Prof. Brigitte Vollmar	Institute for Experimental Surgery, University Medicine Rostock	Cluster II

8 Funding

In 2017, the ScienceCampus Rostock was funded by the Ministry of Agriculture, Environment, and Consumer Protection Mecklenburg-Vorpommern and by the Leibniz Association. Substantial contributions also came from the participating Leibniz Institutes and the University of Rostock. External funding by third parties for phosphorus research at the ScienceCampus Rostock was obtained as well (see Table 1).

Funds from the Ministry of Agriculture, Environment, and Consumer Protection Mecklenburg-Vorpommern (€ 85,000 in 2017) were used mainly to finance the Coordination Office of the ScienceCampus Rostock. Since 2014, the Coordination Office, located at the IOW, has consisted of two employees: a scientist and a secretary.

In 2015, the ScienceCampus Rostock was awarded a total of €1.2 million to be distributed over a period of 4 years to partially fund 11 interdisciplinary PhD projects.

APPENDIX

Program of the lecture series Phosphorus Research WS16/17

Interdisziplinäre Herangehensweise an ein lebenswichtiges Element

Zeit: Wintersemester 2016/2017, donnerstags 15:00-16:30 Uhr

Ort: Hörsaal 002 „Karl von Frisch“ (Blowiss.), A.-Einstein-Str. 3, 18059 Rostock

Datum	Vortragsthema	Referent
03.11.2016	Phosphorversorgung und Phosphordüngung landwirtschaftlich genutzter Böden	Dr. Hans-Eberhard Kape, LMS Agrarberatung – Landwirtschaftliche Fachbehörde
10.11.2016	Einfluss variierender Phosphorgehalte im Futter auf die Knochendichte und -zusammensetzung beim wachsenden Ferkel	Prof. Dr. Petra Wolf, Ernährungsphysiologie und Tierernährung, Universität Rostock
17.11.2016	Die Rolle biologischer Bodenkrusten im Phosphorkreislauf	Dr. Karen Baumann, Bodenkunde, Universität Rostock
24.11.2016	Phosphatmagelanpassung bei Cyanobakterien - Molekulare Grundlagen und die Anpassung des Ostseecyanobakteriums <i>Nodularia spumigena</i> CCY9414	Prof. Dr. Martin Hagemann, Pflanzenphysiologie, Universität Rostock
01.12.2016	Phosphaternährung der Pflanzen im ökologischen Landbau. Der Beitrag der chemischen Phosphatmobilisierung	PD Dr. Jörg Gerke, Landwirt
08.12.2016	Landseitige Phosphoreinträge in die Ostsee - Entwicklung, Herkunft und Reduzierungsansätze	Dr. Clemens Engelke & Franka Koch, Landesamt für Umwelt, Naturschutz und Geologie MV
15.12.2016	Phosphor-Austragspfade und -Muster in landwirtschaftlich genutzten Tieflandeinzugsgebieten	Prof. Dr. Bernd Lennartz, Ressourcenschutz und Bodenphysik, Universität Rostock
05.01.2017	Phosphorhaltige Verbindungen in der organischen Synthese und Katalyse	Dr. Thomas Werner, Organokatalyse, Leibniz-Institut für Katalyse (LIKAT)
12.01.2017	Membranen als Phosphatspeicher - Wie Pflanzen auf Phosphatmangel reagieren	Dr. Meike Siebers, Institut für Molekulare Physiologie und Biotechnologie der Pflanzen (IMBIO), Universität Bonn
19.01.2017	Das P-Dilemma ökologisch bewirtschafteter Grünlandstandorte - Phytodiversität versus Produktionsfunktion?	Dr. Jürgen Müller, Grünland und Futterbauwissenschaften, Universität Rostock
26.01.2017	Glyphosat - Anwendungen in der Landwirtschaft und Auswirkungen auf Ackerunkräuter	Prof. Dr. Bärbel Gerowitt, Phytomedizin, Universität Rostock
02.02.2017	Phosphorus as a key element in cellular signaling and biological energy transductions	Prof. Dr. Inna Sokolova, Marine Biologie, Universität Rostock
09.02.2017	entfällt	
16.02.2017	Technologisches Potential von Niedertemperaturplasmen beim Phosphor-Recycling	Dr. Volker Brüser, Katalytische Materialien, Leibniz-Institut für Plasmaforschung und Technologie

Leibniz ScienceCampus Phosphorus Research Rostock

Tasks of the Coordination Office 2017

The Leibniz ScienceCampus Phosphorus Research Rostock links the research of meanwhile 100 scientists from six research institutions who are active in many different disciplines and involved in 35 externally funded. This linkage is accomplished by the Coordination Office, financed by the Ministry of Agriculture and Environment Mecklenburg-Vorpommern. Without the Office's efforts, neither the close networking of scientists nor a successful external presentation of the ScienceCampus or its structural developments would be feasible. Moreover, the Coordination Office has enabled the acquisition of funds in the amount of €1.35 million from the Leibniz Association in support of graduate education, networking, and the internationalization of the ScienceCampus. In addition, the Coordination Office organizes numerous internal and public events, to promote the national and international networking of the ScienceCampus. Especially, the publication of a special issue on phosphorus research of the journal AMBIO by the Coordination Office was a main task in 2017 and at the same time another highlight of the ScienceCampus.

In the following, the activities and thematic foci of the Coordination Office of the Leibniz ScienceCampus Phosphorus Research Rostock in 2017 are described. The Office is staffed by a scientific coordinator (Dr. Inga Krämer) and an administrative assistant (Daniela Derlet-Eichler). The focus of the Coordination Office's work is the coordination of the partner institutions of the ScienceCampus Phosphorus Research and its individual members, research foci and projects. In 2017, the central task was the publication of the international special volume of the journal AMBIO, a result of the 8th International Phosphorus Workshop (IPW8). Other tasks included i.a. the external representation of the ScienceCampus, the preparation of reports and e-mails providing information to interested parties, the organization of other events of different formats (including the international symposium with invitation of the international advisory council), the preparation for the evaluation of selected Leibniz-ScienceCampi by the Leibniz Association and financial management (together with the administration department of the IOW). The work was carried out in close coordination with the spokesperson and the Steering Group of the ScienceCampus.

In the following, the priorities of the Coordination Office, including its function as a contact point, provider of support in the development of research project proposals, coordinator of the graduate school, and event organizer, as well as its public relations tasks are described in detail.

Contact point

The Coordination Office of the ScienceCampus is the linchpin for networking, both within the ScienceCampus and externally, at national and international levels. In 2017, the Coordination Office continued to serve as a contact for all members of the ScienceCampus, new members and external persons and handled external inquiries, and forwarded targeted information to the relevant members/member groups. By

mediating both internal and external contacts, the office supported networking among scientists. Contacts with external research institutes, ministries, and authorities were regularly maintained, and those with other networks were intensified. This networking activities also included participation in meetings such as the annual forum of the Deutschen Phosphor-Plattform (DPP), the working group "Diffuse Nährstoffeintäge" ("Diffuse nutrient input") at the ministry of agriculture and environment MV, the "Dialog Wasserrahmenrichtlinie" ("EU Water Framework Directive") with agriculture, "Gewässersymposium" (water symposium) of the Landesamtes für Umwelt, Naturschutz und Geologie (LUNG, State Agency for Environment, Nature Conservation and gGeology), the meeting of the faculty Maritime Systems at the University of Rostock, the annual meeting of the coordinators of the Leibniz-ScienceCampi. Contacts to other networks were intensified by these events for example to the network Interdisciplinary Faculty (INF), department Maritime Systems (MTS), the Graduate Academy of the University of Rostock, the DFG Graduate college Baltic Transcoast and by membership in the participation in meetings of the European Sustainable Phosphorus Platform (ESPP) and DPP.

Research topics and initiatives

The ScienceCampus thrives on the continuous initiatives of its scientists in developing research themes and ideas and in considering proposals for their realization.

Through the Coordination Office, relevant funding calls and proposals regarding the acquisition of external research funds for scientists of the ScienceCampus are evaluated.

In preparation for the follow-up application for Leibniz Association funding, thematic concepts and projects for doctoral theses (internal competition) were developed in workshops held in 2017. Seed projects developed in 2016 and funded by the Leibniz Association, were started 2017 and were administratively supported by the Coordination Office (in consultation with the steering group: approval, reports, reallocation etc.).

Structured graduate support

As young scientists are a significant part of the ScienceCampus network, a structured framework for their support and encouragement is offered by the ScienceCampus.

The Coordinator is responsible for the coordination and administration of the Graduate School and organised several events (e.g advanced training) and other networking opportunities for the PhD students. Furthermore, PhD students had the opportunity of funding (for example research trips, extension of PhD-funding, publication costs), which was approved by the steering group. The Coordination Office supported the PhD students by their proposals for funding and organized providing of approved costs.

Event organization

The events organized and guided by the Coordination Office are an important basis not only for networking but also for the internal and external representation of the ScienceCampus.

Among the regular activities that took place in 2017 were the organization of meetings of the Steering Group of the ScienceCampus (including presentation of current developments, record keeping, etc.) and of breakfast gatherings of PhD students of

the ScienceCampus, which promoted mutual exchanges. Furthermore, an internal symposium (06.-07.04.2017) and an international symposium (08.-09.11.2017) with participation of the international scientific advisory council (compiling the program, invitation, catering etc.) as well as the second lecture series Phosphorus Research at the University of Rostock (regional authorities were actively involved) were organized (complete list in Activity report 2017)

Public relations

The Leibniz ScienceCampus is a prominent research network among six partner institutions in Mecklenburg-Vorpommern and is represented not only regionally but also nationally and internationally. The Coordination Office is responsible for the presentation of the Leibniz ScienceCampus Phosphorus Research Rostock at various events, in the media (articles, interviews), and by developing information (handouts, posters, presentations) about the ScienceCampus (for a list, see the Annual Report of the ScienceCampus). That also means that members of the P-Campus were actively addressed to represent the P-Campus at interesting events (conferences, workshops etc.). The Coordination Office offers support related to introducing the ScienceCampus to external scientific groups, policy makers, authorities, and the general public through visual presentations, such as research posters. Together with its PhD students, the ScienceCampus actively participated in the Long Night of Sciences at the University of Rostock. Moreover, the Coordination Office edited a special issue of the international journal AMBIO and thus took over the task of an editor, including the coordination of the editorial committee (6 scientists of the ScienceCampus). The special issue resulted from the International Phosphorus Workshop (IPW8), which was organised 2016 by the ScienceCampus Rostock. This work included the organisation of meetings, the contact between editorial board and authors, reviewers, AMBIO-editors and the publisher Springer but also editing of the manuscripts, cover design, coordination of the foreword and other relevant work. The publication of the special volume was relevant for international networking of the P-Campus but also for publication of several articles of scientists of the P-Campus. In summary, 14 articles - thereby 7 from P-Campus members - were published. A summarising chapter, written by P-Campus members and external experts, provided a comprehensive overview of the topic. Another important task was the design of the website of the Leibniz ScienceCampus Phosphorus Research Rostock, including content development, in coordination with relevant scientists. The website is updated continuously with new information from the ScienceCampus. The Coordinator also compiles texts and information that allow the presentation of the ScienceCampus on other websites (for example, those of the DPP and the ESPP). Therefore it can be summarised that funding of the Coordination Office of the Leibniz-ScienceCampus Phosphorus Research Rostock by the Ministry of Agriculture and Environment MV enabled the first years of development phase and therefore contributed essentially to the success of the ScienceCampus. The takeover of the funding by the Ministry of Education, Science and Culture MV in 2018 was initiated by the annual meeting. On the basis of previous success a new proposal for further four years was submitted to the Leibniz Association.

Imprint

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