Activity Report
2019
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Report of the Coordination Office 2019 ......................................... 27
1 Development of the Leibniz ScienceCampus Phosphorus Research Rostock (Introduction)

The Leibniz ScienceCampus Phosphorus Research Rostock (P-Campus) is linking the phosphorus research of more than 100 scientists from 6 research institutes in different disciplines working in 27 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 2019, numerous events were initiated by the P-Campus to promote networking at all levels. Internal meetings and workshops took place to intensify both the networking of scientists at the P-Campus 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 P-Campus. In the summer semester 2019 the lecture series “Die Wege des Phosphors in der Umwelt und Möglichkeiten der P-Nutzung” containing of 6 presentations was organized by the coordination office of the P-Campus.

Especially the P-Campus Symposium (26.04.2019) and the International P-Campus Symposium (12.-13.11.2019), at which the international scientific advisory council of the P-Campus participated, can be highlighted as events for all members of the P-Campus. Furthermore, the P-Campus is an active member of the ‘Deutsche Phosphor Plattform (DPP)’ and the European Sustainable Phosphorus Platform (ESPP). Further networking activities were e.g. the integration of further PhD students of partner institutes with topics in the field of phosphorus research from various sources of funding. Regardless of the personal exchange the PhD students had e.g. the opportunity to exchange views in a bigger group during the organized P Breakfast (17.12.2019, first P Breakfast with the new PhD students) and the P-Campus symposium.

Moreover, members of the P-Campus are internationally active all year round. The P-Campus has contributed to the financial support of young scientists in their international activities and co-financed the participation in the IPW9 (July 2019) and a research stay at the ETH Zurich (Nov 2019) of two PhD students. Without financial support of the P-Campus, these conference trips and presentations of their results would not have been possible for the young scientists.

The graduate school phosphorus research is the core of the graduate concept of the P-Campus and has the overarching goal of an excellent graduate education. Thematic training and the lively exchange of information among PhD students are supported by different events such as thematic workshops, professional training and informal meetings. The start workshop 'P analytics' at the Biological Station Zingst in November (CW 48) was organized and co-supervised by for the new PhD students of the P-Campus.

In 2019, several important third party funded projects, which can be assigned to the P-Campus, were raised or started, e.g. "RePhoR-MV: Regionales Phosphor-Reecycling aus Klärschlammern in Mecklenburg-Vorpommern" and "MitoBOX: The mitochondrial basis of hypoxia tolerance in marine mollusks" (see Table 1, all projects of 2019).

In the first half year, the last seed projects were granted by the use of remaining funds of the first funding period. To continue the successful concept of the seed projects the first 6 seed projects were granted from June 2019 on. Part of the projects runs until the first half year 2020.
The following five publications received the **Publication Award 2019**, since authors of at least two partner institutes were involved in the peer-reviewed publications:


40 publications were published in **cluster I P in the environment**. Especially the following publications can be highlighted, since they evaluate data sets, which extend in time and space, respectively additionally asking specific analytical questions (allocation to the former cross-sectoral issue P analytics).


Buczko, U., Steinfurth, K., van Laak, M. (2019) Meta-Analysis of the yield response to phosphorus fertilization based on long-term field experiments. Agricu Forest 65, 7-14, doi 10.17707/AgricultForest.65.4.01


In 2019, 20 publications were published in **cluster II Sufficiency and efficiency of P utilization, P recycling**. 5 publications particularly deal with a more efficient animal production.


10 publications were published in cluster III P in synthesis and catalysis, 4 of those of PhD student Lars Longwitz of the LIKAT as lead author.


The public relations work of the P-Campus included in 2019 besides text writing, publishing (e.g. Schaub et al. (2019) Nachwuchsförderung und Forschung am Leibniz-WissenschaftsCampus Phosphorforschung Rostock. Wasser und Abfall 10/2019, 40-46), presentations and maintenance of the website also the representation of the P-Campus by an information stand at the University of Rostock during the Long Night of Sciences on April 25, 2019. An interested public was given an understanding of e.g. the sources and paths of P in the environment, the effect of P in the nutrition on (bone) health of farm animals as well as the effect of soil crusts and earthworms on soil and P availability. Moreover, the P-Campus organized the visit of partner institutes of the P-Campus (presentations and guided tours at FBN, AUF and IOW) for journalists of the German Science Journalists’ Association on 24 and 25 September 2019 within the scope of their research trip “Phosphorus – and the future of agriculture”. One of the journalists published an article about the visit at the P-Campus in January 2020 in the journal ‘Nachrichten aus der Chemie’ (Osterath, B. “Ressourcenmanagement – Ein paar Schippchen weniger”).

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 P-Campus, 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 P-Campus. Cooperation and research are intensified and strong national and international networks established.

The following institutes are partners of the P-Campus:

- 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 of Plant Genetics and Crop Plant Research (IPK), Satellite Collections North, Groß Lüsewitz
- Leibniz Institute for Plasma Science and Technology (INP), Greifswald
- University of Rostock (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 P-Campus are:

- Cluster I: P in the Environment
- Cluster II: Sufficiency and Efficiency of P Utilization, P Recycling
- Cluster III: P in Synthesis and Catalysis
- Cluster IV: Molecular Biology of P
- Cluster V (cross-topic): P Governance

3.1.1 Cluster I: P 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: P in Synthesis and Catalysis

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 synthesis. 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 organocatalysts are gaining increasing importance.

3.1.4 Cluster IV: Molecular Biology of P

The overarching goal is to unravel the central role of P as a metabolic, signaling and regulatory molecule from molecular to ecosystem levels. In fact, P acquisition, mobilization and assimilation involve various molecular mechanisms in microorganisms, plants and animals. Moreover, P plays a key role in signaling at the level of ecosystems, organisms and cells. Projects in this Cluster aim to analyze the molecular mechanisms related to the uptake of P from the environment into the organism, the distribution, storage and mobilization of P within the organisms and its essential roles in the cellular metabolism as well as in the crosstalk of microorganisms, cells and tissues.

3.1.5 Cluster V (cross-topic): P Governance

Cluster V of the P-Campus aims at possible policy instruments to strengthen P-recycling (consistency), efficiency and sufficiency in the use of P-fertilizers and deals with their implementation in society and agricultural practice through effective legal frameworks. The aim of the subproject is to deepen the analysis and further development of agricultural, fertilizer, water, soil protection, waste and recycling legislation and to develop concrete governance options for closed P cycles at different legal levels. Natural scientific findings generated within the framework of the P-Campus will be included as well as current political and legal developments. A current priority is the monitoring and further development of the EU Common Agricultural Policy for the 2021-2027 funding phase.
3.2 Research Projects

Within the research clusters, 27 disciplinary and interdisciplinary, externally funded projects were thematically assigned to the P-Campus in 2019 (table 1). Six of these projects started newly in 2019. The Graduate School I, funded by the Leibniz Association, conducts research in 11 thematically affiliated individual projects, which are listed in table 2a. The Graduate School II consists of 15 projects, which are listed in table 2b. Additionally, six seed projects from the first funding period run in 2019 and six new seed projects were granted (five started in 2019), which partly run until 2020 (table 3).

Table 1. Research projects thematically assigned to the P-Campus (status as of December 2019; *italics*: phosphorus not a subject of the total project or members of the P-Campus only active in parts of the project)

<table>
<thead>
<tr>
<th>Project Name</th>
<th>Term</th>
<th>Sponsor</th>
<th>Participating Partners of the P-Campus</th>
<th>Cluster</th>
</tr>
</thead>
<tbody>
<tr>
<td>AC/DC-weeds: Applying and combining disturbance and competition for an agro-ecological management of creeping perennial weeds</td>
<td>04/2019-03/2022</td>
<td>DFG</td>
<td>University of Rostock (AUF)</td>
<td>I</td>
</tr>
<tr>
<td>BACOSA II: Baltic Coastal System Analysis and Status Evaluation</td>
<td>04/2016-03/2019</td>
<td>BMBF</td>
<td>University of Rostock (MNF, AUF)</td>
<td>I</td>
</tr>
<tr>
<td>Baltic Transcoast</td>
<td>01/2016-06/2020</td>
<td>DFG</td>
<td>University of Rostock (AUF, MNF, IOW)</td>
<td>I</td>
</tr>
<tr>
<td>Biomasse-Asche-Monitoring (BAM) Teilvorhaben 2: Agronomische Bewertung</td>
<td>11/2016-10/2019</td>
<td>BMELV</td>
<td>University of Rostock (AUF)</td>
<td>II</td>
</tr>
<tr>
<td>CLIMARCTIC: Einfluss des Klimawandels auf arktische Boden- und See-Mikrobiome</td>
<td>03/2017-02/2020</td>
<td>DFG</td>
<td>University of Rostock (MNF)</td>
<td>I</td>
</tr>
<tr>
<td>CRUSTFUNCTION II: Biodiversität und funktionelle Rolle von biologischen Bodenkrusten II</td>
<td>07/2017-06/2020</td>
<td>DFG</td>
<td>University of Rostock (AUF, MNF)</td>
<td>I</td>
</tr>
<tr>
<td>DachKüNO II: Wissens- und Datentransfer in der Küstenmeeforschung</td>
<td>01/2017-12/2019</td>
<td>BMBF</td>
<td>IOW</td>
<td>I</td>
</tr>
<tr>
<td>DiveCropS: Diversifying cropping systems - Traditional knowledge and innovative approaches</td>
<td>01/2019-12/2022</td>
<td>DAAD</td>
<td>University of Rostock</td>
<td>II</td>
</tr>
<tr>
<td>Glyphosat: Untersuchungen der Eigenschaften und Wirkungsweisen von Glyphosat im Boden</td>
<td>02/2016-01/2019</td>
<td>Landesgenützstellenpendium MV</td>
<td>University of Rostock</td>
<td>I, II, Q</td>
</tr>
<tr>
<td>Graduate School I: Leibniz ScienceCampus Phosphorus Research Rostock</td>
<td>04/2015-06/2019</td>
<td>WGL</td>
<td>FBN, IOW, IPK, LIKAT, University of Rostock</td>
<td>I, II, III, Q</td>
</tr>
<tr>
<td>Graduate School II: Leibniz ScienceCampus Phosphorus Research Rostock</td>
<td>07/2019-06/2023</td>
<td>WGL</td>
<td>FBN, IOW, IPK, LIKAT, University of Rostock</td>
<td>I, II, III, IV, V</td>
</tr>
<tr>
<td>InFertRes: Innovative Fertilizers and Resource Efficiency in Agriculture</td>
<td>03/2018-02/2021</td>
<td>BMBF</td>
<td>University of Rostock (AUF)</td>
<td>II</td>
</tr>
<tr>
<td>InnoAquaTech: Cross-border development and transfer of innovative and sustainable aquaculture technologies in the South Baltic area</td>
<td>07/2016-06/2019</td>
<td>Interreg South Baltic</td>
<td>University of Rostock (AUF)</td>
<td>II</td>
</tr>
<tr>
<td>Project Name</td>
<td>Term</td>
<td>Sponsor</td>
<td>Participating Partners of the P-Campus</td>
<td>Cluster</td>
</tr>
<tr>
<td>--------------</td>
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</tr>
<tr>
<td>InnoSoilPhos II: Innovative solutions to sustainable soil phosphorus management</td>
<td>03/2018 - 02/2021</td>
<td>BMBF</td>
<td>University of Rostock (AUF)</td>
<td>I, II, Q</td>
</tr>
<tr>
<td>INTEGRAL: Integrated carbon and trace gas monitoring for the Baltic Sea</td>
<td>07/2017-06/2020</td>
<td>BONUS</td>
<td>IOW</td>
<td>I</td>
</tr>
<tr>
<td>KataPlasma: Hydroformylierung mit homogenen Katalysatoren geträgert auf Plasma funktionisierten Materialien</td>
<td>06/2016 - 05/2019</td>
<td>BMBF</td>
<td>LIKAT, INP</td>
<td>III</td>
</tr>
<tr>
<td>Kombination von Biokatalyse und Kristallisation für die Synthese chiraler Amine</td>
<td>04/2019-03/2022</td>
<td>BMWi</td>
<td>University of Rostock (MNF)</td>
<td>III</td>
</tr>
<tr>
<td>INTEGRAL: Integrated carbon and trace gas monitoring for the Baltic Sea</td>
<td>07/2017-06/2020</td>
<td>BONUS</td>
<td>IOW</td>
<td>I</td>
</tr>
<tr>
<td>MOSSCO II: Modular System for Shelves and Coasts</td>
<td>04/2016-03/2019</td>
<td>BMBF</td>
<td>IOW</td>
<td>I</td>
</tr>
<tr>
<td>NuReDrain: Innovative Nutrient Catching Reactive Barrier and Controlled Drainage Technologies for Sustainable Growth of the Agriculture Sector</td>
<td>2017-2020</td>
<td>North Sea Region Programme (EU)</td>
<td>University of Rostock (AUF)</td>
<td>I, II</td>
</tr>
<tr>
<td>OPTIMUS: Optimierung von Muschelfarmen zur Eutrophierungsvermeidung und zur Fischfutterproduktion in der Ostsee</td>
<td>04/2017-03/2020</td>
<td>BONUS</td>
<td>IOW</td>
<td>I</td>
</tr>
<tr>
<td>P FOWL: Inositolphosphate und Myo-Inositol beim Geflügel</td>
<td>09/2017-08/2020</td>
<td>DFG</td>
<td>FBN</td>
<td>II</td>
</tr>
<tr>
<td>PEGaSus: Phosphorus efficiency in Gallus and Sus scrofa: Bridging the gaps in the phosphorus value chain</td>
<td>09/2017-08/2020</td>
<td>ERA-NET SUSAN</td>
<td>FBN</td>
<td>I, II</td>
</tr>
</tbody>
</table>

**Table 2a.** Subprojects of the Graduate School Phosphorus Research Rostock (financed by the Leibniz Association and partners of the P-Campus): 2015–2019

<table>
<thead>
<tr>
<th>Project</th>
<th>Participating Partners</th>
<th>Research Focus</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quality, quantity and transformation of P losses from diffuse sources to the Baltic Sea</td>
<td>IOW, UR</td>
<td>I</td>
</tr>
<tr>
<td>Phosphatases – Development of new quantitative assays along terrestrial-aquatic gradients</td>
<td>UR, IOW</td>
<td>I</td>
</tr>
<tr>
<td>Natural and anthropogenic organic P compounds – inositolphosphates, phospholipids and glyphosate</td>
<td>IOW, UR</td>
<td>I, II, Q</td>
</tr>
<tr>
<td>Mechanisms of P mobilization in the rhizosphere involving weeds and crop plants</td>
<td>UR, IPK</td>
<td>II</td>
</tr>
<tr>
<td>Genetic regulation of phosphatase production and activity to increase P uptake from deficient soils</td>
<td>UR, IPK</td>
<td>II</td>
</tr>
<tr>
<td>Genetic and nutritional effects on the efficiency of P use of monogastric animals</td>
<td>FBN, UR</td>
<td>II</td>
</tr>
<tr>
<td>The P cycle and its application in land-based integrated aquaculture systems</td>
<td>UR, FBN</td>
<td>II</td>
</tr>
<tr>
<td>Political-legal P governance by means of certificate markets and charges</td>
<td>UR, IOW</td>
<td>II</td>
</tr>
<tr>
<td>Processing of alternative P sources for fertilization in agriculture</td>
<td>INP, UR</td>
<td>II, III</td>
</tr>
<tr>
<td>Synthesis of new heterocyclic ring systems containing P</td>
<td>LIKAT, UR</td>
<td>III</td>
</tr>
<tr>
<td>Large scale application of P based organocatalysts in batch and flow for the synthesis of fatty acid derived cyclic carbonates</td>
<td>LIKAT, UR</td>
<td>III</td>
</tr>
</tbody>
</table>
Table 2b. Subprojects of the Graduate School Phosphorus Research Rostock (financed by the Leibniz Association and partners of the P-Campus): 2019–2023

<table>
<thead>
<tr>
<th>Project</th>
<th>Participating Partners</th>
<th>Research Focus</th>
</tr>
</thead>
<tbody>
<tr>
<td>I.1 Risks and benefits of rewetting coastal wetlands after agricultural use</td>
<td>UR, IOW</td>
<td>I</td>
</tr>
<tr>
<td>I.2 P Pools and mobilization potential in lowlands and coastal regions</td>
<td>UR, LIKAT</td>
<td>I</td>
</tr>
<tr>
<td>I.3 Analysis of glyphosate and glufosinate in sea water and as indicator compounds for industrial cropping</td>
<td>IOW, UR</td>
<td>I</td>
</tr>
<tr>
<td>II.1 P recycling in animal husbandry</td>
<td>UR, IOW, FBN</td>
<td>II</td>
</tr>
<tr>
<td>II.2 Efficiency of recovered phosphorus for monogastric animals</td>
<td>UR, FBN</td>
<td>II</td>
</tr>
<tr>
<td>II.3 P efficiency of forage legumes and their capacity to utilize P from recycling products</td>
<td>IPK, UR</td>
<td>II</td>
</tr>
<tr>
<td>III.1 Synthesis of novel P-based ligands for complexes to activate small molecules</td>
<td>LIKAT, UR</td>
<td>III</td>
</tr>
<tr>
<td>III.2 Application of P-based organocatalysts and biocatalysts for the resolution of racemic carbonates</td>
<td>UR, LIKAT</td>
<td>III</td>
</tr>
<tr>
<td>III.3 Synthesis of potential anti-tumor and adhesion-promoting agents by P-based organocatalysis for oncology and biomedical engineering</td>
<td>LIKAT, UMR, INP</td>
<td>III</td>
</tr>
<tr>
<td>IV.1 Gene expression in biogeochemical cycling of phosphorus in biological soil crusts of sand dunes of the Baltic Sea</td>
<td>UR, IOW</td>
<td>IV</td>
</tr>
<tr>
<td>IV.2 Sustainability of potato production: Cloning and sequencing of candidate genes improving P acquisition efficiency to reduce fertilizer inputs</td>
<td>UR, IPK</td>
<td>IV</td>
</tr>
<tr>
<td>IV.3 The role of inorganic phosphate supply on the development of cyanobacterial summer blooms in the Baltic Sea</td>
<td>UR, IOW</td>
<td>IV</td>
</tr>
<tr>
<td>IV.4 Phosphorus as a metabolic regulator during environmental stress in animals</td>
<td>UR, IOW, FBN</td>
<td>IV</td>
</tr>
<tr>
<td>IV.5 Molecular mechanisms of phosphate homeostasis and osteoimmunological processes and their consequence for health and welfare</td>
<td>FBN, UMR</td>
<td>IV</td>
</tr>
<tr>
<td>V. Governance options for closed P cycles - the GAP 2020 revision</td>
<td>UR, IOW</td>
<td>V</td>
</tr>
</tbody>
</table>

Table 3. In 2019, 12 seed projects started in cooperation between partners of the P-Campus, financed by the Leibniz Association (condensed reports of the projects can be provided on request).

<table>
<thead>
<tr>
<th>Project</th>
<th>Participating Partners</th>
</tr>
</thead>
<tbody>
<tr>
<td>Funding Period 1</td>
<td></td>
</tr>
<tr>
<td>Novel mechanisms of P-dependent energy transductions in an animal extremophile (01/2019-06/2019)</td>
<td>IOW, UR</td>
</tr>
<tr>
<td>Cyclovoltammometrische Messungen an Phosphorliganden (P-Redox) (03/2019-06/2019)</td>
<td>UR, LIKAT</td>
</tr>
<tr>
<td>Glyphosate „Beeinflussung der Biodiversität &amp; biologischen Aktivität in terrestrischen und aquatischen Systemen durch Glyphosat und AMPA“ (03/2019-06/2019)</td>
<td>UR, IOW</td>
</tr>
<tr>
<td>Shifted excitation Raman difference spectroscopy testing for analysis of inorganic phosphorus, inositol phosphates (InsPχ) and myo-inositol in environmental and animal samples (SERAIP) (03/2019-06/2019)</td>
<td>FBN, FBH, UR</td>
</tr>
<tr>
<td>Synthese von isotopenmarkiertem AMPA für die qualitative und quantitative Analyse des Glyphosatabbaus im Boden (AMPA) (03/2019-06/2019)</td>
<td>IOW, LIKAT, UR</td>
</tr>
<tr>
<td>Zusammenstellung von Langzeitdaten und Ringversuchsdaten zum P-Aufschluss aus unterschiedlichen Naturmaterialien innerhalb des P-Campus für das eBook P analytics (P-Digest) (03/2019-06/2019)</td>
<td>UR, IOW, INP</td>
</tr>
</tbody>
</table>
3.3 Graduate Concept/Graduate School Phosphorus Research

The structured training concept of the P-Campus (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 are provided to young scientific members of the P-Campus. In addition to their inclusion in events involving the P-Campus and in scientific and thematic networks, for example, those of the DPP and ESPP, they can apply to the P-Campus for grants and for financial support for internationalization (travels, publications and visiting scientists, including longer stays).

The Graduate School of Phosphorus Research is the core of the graduate concept of the P-Campus. 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 doctoral projects of the first period and the 15 doctoral projects of the second period cover important areas of knowledge and research (table 2a + 2b). BSc and MSc thesis topics in phosphorus research have also been developed during the first period.

All doctoral students are supervised by a committee of scientists from at least two partner organizations of the P-Campus (e.g. the Leibniz Institute for Baltic Sea Research and...
the University of Rostock). The students present their work at the annual P-Campus Symposium, held in November. Lively exchanges of information between doctoral students are promoted through various events, such as workshops and the regularly held P-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. Until the end of 2019, three PhD students of the first graduate school completed their doctoral thesis (green letters in table 2a) and another PhD student submitted his doctoral thesis (orange letters in table 2a). Five more dissertations shall be submitted in the course of 2020. Two PhD students dropped out due to personal reasons, the respective supervisors finished the projects. Seven new PhD students started in 2019, being part of the second graduate school (green letters in table 2b). The other eight PhD students will be employed until summer 2020.

### 3.4 Publications

Publications of the members of the P-Campus in 2019:


**Ahmed, A. A, Gypser, S, Leinweber, P, Freese, D, Kühn, O (2019)** Infrared spectroscopic characterization of phosphate binding at the goethite-water interface. Physical Chemistry Chemical Physics 21, 4421, doi 10.1039/C8CP07168C


Buczko, U, Steinfurth, K, van Laak, M (2019) Meta-Analysis of the yield response to phosphorus fertilization based on long-term field experiments. Agric Forest 65, 7-14, doi 10.17707/AgricultForest.65.4.01


Longwitz, L, Spannenberg, A, Werner, T (2019) Phosphetane oxides as redox cycling catalysts in the catalytic Wittig reaction at room temperature. ACS Catal 9, 10, 9237-9244, doi 10.1021/acscatal.9b02456


3.5 Theses

<table>
<thead>
<tr>
<th>Thesis</th>
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<tr>
<td><strong>Dissertations</strong></td>
<td></td>
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<td>Braun, P (2019) Phosphatakkumulation in diazotrophien, filamentösen Cyanobakterien der Ostsee</td>
<td>MNF, UR</td>
</tr>
<tr>
<td><strong>Master Theses</strong></td>
<td></td>
</tr>
<tr>
<td>Bickel, U (2019) Uso de plagicidas por productores familiares en Bolivia</td>
<td>AUF, UR</td>
</tr>
</tbody>
</table>
4 Networking

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

Deutsche Phosphor Plattform (DPP) – Participation in general assembly (25.09.2019, Dr. D. Zimmer) and annual forum (26.09.2019, Dr. D. Zimmer) in Frankfurt/Main.

Networking meeting of the coordinators of the Leibniz ScienceCampi, Berlin, 26.11.2019 (Dr. M. Oster).

Meeting with representatives of the new Leibniz ScienceCampus ComBioCat (20.08.2019: Dr. D. Zimmer; 19.11.2019: Prof. U. Bathmann, PD Dr. T. Werner, Dr. D. Zimmer).

5 Events

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

5.1 Public Events

Symposium of the Leibniz ScienceCampus Phosphorus Research Rostock, 26.04.2019 at the Leibniz Institute for Catalysis (LIKAT)

Meeting of scientists of the P-Campus with journalists of the German Science Journalists’ Association within the scope of the research trip “Phosphorus – and future of agriculture” at FBN, University of Rostock (AUF) and IOW, 24.-25.09.2019
International Symposium of the Leibniz ScienceCampus Phosphorus Research Rostock, 12.-13.11.2019, at the Leibniz Institute for Baltic Sea Research (IOW), Warnemünde

5.2 Internal Meetings and Workshops

Internal meetings and workshops facilitate intensive networking and thematic exchanges between scientists of the P-Campus. 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 P-Campus meets roughly every 3 months to discuss overarching issues as well as the strategic orientation and further development of the P-Campus.

Meetings of the steering group of the P-Campus: 10.01.19, 01.04.19, 09.05.19, 28.06.19, 03.09.19, 28.10.19

"P Breakfast" to promote exchanges among PhD students of the P-Campus, taking place at the various partner institutes including presentation of the P research on-site: 22.03.2019 (University of Rostock, AUF), 17.12.2019 (University of Rostock, MNF)

Start-Workshop “P Analytics” for the new PhD students of the P-Campus, 26.-29.11.2019 at the Biological Station Zingst

6 Public Relations

The P-Campus 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)

IPW9, 8 – 12 July 2019, Zurich, Switzerland
B. Eichler-Löbermann et al. Phosphorus pools in the soil profile – results of different fertilizer practices over 20 years
F. Ekardt et al. Animal food, land use governance, and P governance
M. Oster et al. Molecular determinants of phosphorus utilization in pigs
M. Pallentin et al. Determination of atmospheric phosphorus deposition in the German part of the Baltic Sea
J. Stubenrauch et al. P governance from a cross-national perspective

PhosWaM Final Workshop, 17 – 18 September 2019, Rostock, Germany
U. Buczko et al. Evaluation of the impact of agronomic measures on agricultural P-discharge with a P index approach
M. Nausch et al. Phosphorus concentrations along the river Warnow discharging to the Baltic Sea
D. Neumann et al. Modelling processing and transport of phosphorus compounds from the Warnow river in the bay of Mecklenburg
L. Rönspeß et al. Estuarine phosphorus transformation, retention and bioavailability: an example from the southern Baltic Sea
J. Tränckner et al. Determination of P-discharge and optimization possibilities for P retention in small sewage treatment plants

Annual Meeting of the German Soil Science Society (DBG), 24 – 29 August 2019, Bern, Switzerland

K. Baumann et al. Biocrusts - The Atacama Desert’s unexpected living skin

A. Zacher et al. Einfluss des Anbaus von Serradella als Zwischenfrucht auf die P-Mobilisierung im Boden

12th Rostocker Abwassertagung: Emissionsminderung von Punktquellen im ländlichen Raum, 10 September 2019, Rostock, Germany

J. Tränckner et al. Niederschlagswasser auf landwirtschaftlichen Betriebshöfen und Biogasanlagen

S. Tränckner et al. Phosphorelimination in kleinen Kläranlagen durch nachgeschaltete alkalische Fällungfiltration

Conference of the Umbrella Association Agricultural Research, 10 October 2019, Berlin, Germany

C. Baum. Perspektiven für die verbesserte Nutzung der Mykorrhizierung: Chancen und Grenzen

U. Buczko. Düngewirkung von Phosphat auf Basis einer Metastudie über langjährige P-Düngungsversuche

F. Ekardt. Phosphor als Problem von Politik und Recht

P. Leinweber. Phosphor im System „Boden Pflanze Gewässer: Grundlagen und aktuelle Forschungsprobleme"

B. Lennartz. P-Verlagerung in Böden und Landschaften des Norddeutschen Tieflands

Other Events

B. Eichler-Löbermann. Wirkungen von Kompost – Ergebnisse eines Dauerversuchs. 21st Fachtagung of the VHE-Nord e.V., 05.06.2019, Rostock, Germany

M. Nelles et al. Optionen für die künftige Entsorgung von Klärschlamm in Mecklenburg-Vorpommern. DGAW Regionalveranstaltung, 19.06.2019, Neuruppin, Germany

H. Reyer, M. Oster, D. Wittenburg, E. Murani, S. Ponsuksili, K. Wimmers. Molecular drivers of the phosphorus homeostasis in pigs. EAAP - 70th annual meeting, 26.-30.08.2019, Ghent, Belgium


B. Eichler-Löbermann et al. Yield development and soil fertility – results of different phosphorus fertilizer practices over 20 years. DOK-Monte Verità, 6. – 11.10.2019, Ascona, Switzerland

U. Bathmann (as spokesperson of the P-Campus) as well as H. Jarvie and C. Müller (members of the scientific advisory council of the P-Campus) held a presentation at the event “Die Zukunft der interdisziplinären Forschung” (Engl. the future of the interdisciplinary research) on the subject of “Begrenzte Ressourcen und wie wir mit ihnen umgehen sollten” (Engl. limited resources and how we should handle them) and participated in the panel discussion, 11.11.2019, within the scope of the 600 years anniversary of the University of Rostock


6.2 Posters (Selection)

**IPW9, 8 – 12 July 2019, Zurich, Switzerland**

A. Ahmed et al. New insights into IR spectroscopic characterization of phosphate binding at the goethite-water interface

B. Garske et al. Regulatory and Economic Instruments of Phosphorus Governance

M. Kavka et al. Root system architecture of potato after cultivation in different phosphorus fertilizer treatments

P. Koal et al. Replacing conventional phosphorus fertilisers with biomass ashes: fertilisation effect of straw ashes on different crops

P. Leinweber et al. Weathering of bone char particles and P-release in a perennial pot experiment sowie InnoSoilPhos: advances in the understanding and managing of agricultural phosphorus use

M. Nausch et al. Phosphorus concentrations and composition along a lowland river in northeast German catchment discharging to the Baltic Sea

L. Rönsiess et al. Different phosphorus fractions – how bioavailable are they?

K. Steinfurth et al. Comparability of the Calcium-Acetate-Lactate and Double-Lactate extraction methods to assess soil phosphorus fertility sowie Yield response to omitted phosphorus fertilization – results of a meta-study

T. Zicker et al. Long-term application of biogas digestates affects phosphorus pools in the soil profile

D. Zimmer et al. Leibniz-ScienceCampus Phosphorus Research Rostock

**Annual Meeting of the German Soil Science Society (DBG), 24 – 29 August 2019, Bern, Switzerland**

M. Peine et al. Einfluss von Bioporen auf die P-Mobilisierung in Ackerböden

J. Prüter et al. Umsetzungsprozesse und Reaktionen von Phosphorverbindungen entlang verschiedener Transekte von Böden und Sedimenten in der nordostdeutschen Küstenregion

D. Zimmer et al. Forschung im Leibniz-WissenschaftsCampus Phosphorforfung Rostock
6.3 Press

Regionale Schwerpunktsetzung mit internationaler Strahlkraft – Press Release of the Leibniz Association, 02.04.2019

Millionenförderung für Rostocker Phosphorforschung – Article on welt.de, 09.04.2019


Nährstoffbelastung im Blick: Rostocker erforschen Qualität der Küstengewässer - Article on svz.de, 29.07.2019

Nachwuchsförderung und Forschung am Leibniz-WissenschaftsCampus Phosphorfor-schung Rostock - Article in Wasser und Abfall No. 10/2019, pp. 40-46, October 2019

Phosphorwirkung von Kompost – Article in Humuswirtschaft & Kompost, Q3 2019, pp. 1 – 2, 10.10.2019

Phosphor-Campus-Symposium in Warnemünde – TV report on NDR about the P-Campus Symposium, 15.11.2019

6.4 Websites


Leibniz-Association/ScienceCampi: www.leibniz-gemeinschaft.de/en/research/leibniz-sciencecampi/phosphorous-research

6.5 Others

D. Zimmer, C. Gerlinger, J. Prüter, L. Rönspieß. Information point and presentation of the Leibniz ScienceCampus Phosphorus Research Rostock at the Long Night of Sciences, University of Rostock, 25.04.2019

D. Zimmer. presentation of the Leibniz ScienceCampus Phosphorus Research Rostock (funding period 2) at the Research Camp of the University of Rostock, 21.11.2019

7 Structure and Committees

7.1 Structure

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

The organisation of the Leibniz 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 P-Campus. 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 Leibniz ScienceCampus Phosphorus Research and in addition to advising has the task of
evaluating the scientific work of the P-Campus. Currently, more than 70 scientists and 20 PhD students from 40 Working Groups are Members (see Partners and Members) of the P-Campus.

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

![Diagram of Leibniz Science Campus Phosphorus Research Rostock]

**Figure 2.** Structure of the Leibniz ScienceCampus Phosphorus Research Rostock

### 7.2 Committees

#### 7.2.1 Scientific Advisory Council

- Prof. Dr. Emmanuel Frossard, ETH Zürich
- Prof. Dr. Ellery D. Ingall, Georgia Institute of Technology
- Prof. Dr. Helen Jarvie, Centre for Ecology & Hydrology (CEH), UK
- Prof. Dr. Christian Müller, FU Berlin
- Prof. Dr. Heidrun Steinmetz, TU Kaiserslautern

#### 7.2.2 Directorship

- Prof. Dr. Ulrich Bathmann, IOW
- Prof. Dr. Matthias Beller, LIKAT
- Prof. Dr. Andreas Graner, IPK
- Prof. Dr. Wolfgang Schareck, UR
- 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, UR (spokesperson of the university)

#### 7.2.4 Steering Committee

- Prof. Dr. Ulrich Bathmann, IOW
- Dr. Volker Brüser, INP
- Dr. Klaus Dehmer, IPK
- Prof. Dr. Bettina Eichler-Löbermann, UR
- PD Dr. Dagmar-Christian Fischer, UniMed Rostock
- Dr. Marion Kanwischer, IOW
Substitutes:
Dr. Silvia Bachmann-Pfabe, IPK
PD Dr. Tom Goldammer, FBN
Dr. Christian Hering-Junghans, LIKAT
Dr. Stephan Reuter, INP
Prof. Dr. Axel Schulz, UR/LIKAT

7.2.5 Coordination Office
(Work and tasks 2019: see Appendix)
Dr. Carsten Mönnig (until January 2019), Dr. Dana Zimmer (since 15.10.2018) (Coordinator)
Daniela Derlet-Eichler (until 30.06.2019), Maxi Hoche (since 01.09.2019) (Secretary)

7.2.6 Members
(Status: Updated during 2019)

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

<table>
<thead>
<tr>
<th>Name</th>
<th>Position</th>
<th>Cluster</th>
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</thead>
<tbody>
<tr>
<td>Prof. Dr. Matthias Beller</td>
<td>Applied Homogeneous Catalysis</td>
<td>III</td>
</tr>
<tr>
<td>Prof. Dr. Armin Börner</td>
<td>Asymmetric Catalysis</td>
<td>III</td>
</tr>
<tr>
<td>Prof. Dr. Marko Hapke</td>
<td>Cycloadditions and Transition Metal Catalysis</td>
<td>III</td>
</tr>
<tr>
<td>Dr. Christian Hering-Junghans</td>
<td>Small Molecule Activation</td>
<td>III</td>
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<tr>
<td>Yuya Hu</td>
<td>Organocatalysis</td>
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</tr>
<tr>
<td>Lars Longwitz</td>
<td>Organocatalysis</td>
<td>III</td>
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<tr>
<td>Dr. Dirk Michalik</td>
<td>Analytical Service</td>
<td>III</td>
</tr>
<tr>
<td>Prof. Dr. Uwe Rosenthal</td>
<td>Coordination Chemistry and Catalysis</td>
<td>III</td>
</tr>
<tr>
<td>PD Dr. Thomas Werner</td>
<td>Organocatalysis</td>
<td>III</td>
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**Leibniz Institute for Farm Animal Biology (FBN), Dummerstorf**

<table>
<thead>
<tr>
<th>Name</th>
<th>Position</th>
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<tbody>
<tr>
<td>Christian Gerlinger</td>
<td>Genome Biology</td>
<td>II</td>
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<tr>
<td>PD Dr. Tom Goldammer</td>
<td>Genome Biology</td>
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<td>Franziska Just</td>
<td>Genome Biology</td>
<td>II</td>
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<tr>
<td>Prof. Dr. Cornelia Metges</td>
<td>Institute of Nutritional Physiology &quot;Oskar Kellner&quot;</td>
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<tr>
<td>Dr. Michael Oster</td>
<td>Genome Biology</td>
<td>II</td>
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<tr>
<td>Mohammad Seyed Almoosavi</td>
<td>Institute of Nutritional Physiology &quot;Oskar Kellner&quot;</td>
<td>II</td>
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<tr>
<td>Prof. Dr. Klaus Wimmers</td>
<td>Genome Biology / Director</td>
<td>II</td>
</tr>
<tr>
<td>Dr. Siriluck Wimmers</td>
<td>Functional Genome Analysis</td>
<td>II</td>
</tr>
</tbody>
</table>
Leibniz-Institute for Baltic Sea Research (IOW)

Directorate
Prof. Dr. Ulrich Bathmann  Director  Cluster I
Dr. Evgeny Sokolov  Directorate  Cluster IV
Dr. Dana Zimmer  Coordination Office  Cluster II

Department Biological Oceanography
Philipp Braun  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

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

Department Physical Oceanography and Instrumentation
Dr. Daniel Neumann  Marine biogeochemical modeling  Cluster I
Dr. Thomas Neumann  Baltic Sea system dynamics  Cluster I
Dr. Hagen Radtk  Baltic Sea system dynamics  Cluster I

Leibniz Institute of Plant Genetics and Crop Plant Research (IPK), Satellite Collections North, Groß Lüsewitz
Dr. Silvia Bachmann-Pfabe  Genebank, Satellite Collections North  Cluster II
Dr. Christine Brandt  Genebank, Satellite Collections North  Cluster II
Dr. Klaus Dehmer  Genebank, Satellite Collections North  Cluster II
Prof. Dr. Andreas Graner  Director  Cluster II
Mousumi Hazarika  Genebank, Satellite Collections North  Cluster II
Yue Hu  Genebank, Satellite Collections North  Cluster II

Leibniz Institute for Plasma Science and Technology (INP), Greifswald
Dr. Volker Brüser  Catalytic Materials  Cluster II
Sina Jahanbakhsh  Catalytic Materials  Cluster II
Prof. Dr. Klaus-Dieter Weltmann  Director  Cluster II
University of Rostock (UR)
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. 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
Dr. Carsten Croonenbroeck  Agricultural Economics  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
Peter Gros  Soil Science  Cluster II
Sebastian Heller  Grassland and Fodder Sciences  Cluster I
Katharina Heyl  Research Unit Sustainability and Climate Policy  Cluster V
Prof. Dr. Florian Jansen  Landscape Ecology and Site Evaluation  Cluster I
Dr. Petra Kahle  Soil Physics  Cluster I, II
Dr. Mareike Kavka  Agronomy  Cluster II
Prof. Dr. Norbert Kanswohl  Agricultural Technology and Process Engineering  Cluster II
Dipl. Agr.-Ing. Ulrich Knaus  Aquaculture and Sea-Ranching  Cluster I, II
Philipp Koal  Agronomy  Cluster II
Dr. Stefan Koch  Soil Physics  Cluster I
Prof. Dr. Peter Leinweber  Soil Science  Cluster II,Q
Prof. Dr. Bernd Lennartz  Soil Physics  Cluster I, II
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
Julia Prüter  Soil Science  Cluster I, Q
Jonathan Schleyken  Water Resources Management  Cluster 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
Jutta Wieding  Research Unit Sustainability and Climate Policy  Cluster II
Paul Winklhofer  Crop Health  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

Theresa Zicker  
Agronomy  
Cluster II

Faculty of Law

Prof. Felix Ekardt  
Research Unit Sustainability and Climate Policy  
Cluster II

Faculty of Mathematics and Natural Sciences

Dr. Ashour Ahmed  
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Cluster Q

Martin Albrecht  
Institute for Biological Sciences, Applied Ecology & Phycology  
Cluster I

Maximilian Berthold  
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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

Dr. Karin Glaser  
Institute for Biological Sciences, Applied Ecology & Phycology  
Cluster I

Prof. Dr. Martin Hagemann  
Institute for Biological Sciences, Animal Physiology  
Cluster II

Sandra Kammann  
Institute for Biological Sciences, Applied Ecology & Phycology  
Cluster IV

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  
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Cluster I

Prof. Dr. Axel Schulz  
Institute for Chemistry, Anorganic Chemistry  
Cluster III

PD Dr. Rhena Schumann  
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Cluster I, Q

Prof. Dr. Inna Sokolova  
Marine Biology  
Cluster II

Dr. Jan von Langermann  
Institute for Chemistry, Biocatalysis  
Cluster III

Rostock University Medical Center

PD Dr. Hugo Murua Escobar  
Hematology, oncology and palliative care  
Cluster III

PD Dr. Dagmar-Christiane Fischer  
Pediatric Clinic, Experimental Pediatrics Group  
Cluster II

Prof. Brigitte Vollmar  
Institute for Experimental Surgery, University Medicine Rostock  
Cluster II
8 Funding

In 2019, the P-Campus was funded by the Ministry of Education Mecklenburg-Vorpommern, by the Leibniz Association and by substantial contributions from the participating Leibniz Institutes and the University of Rostock. External funding by third parties for phosphorus research at the P-Campus was obtained as well (see table 1).

Funds from the Ministry of Education Mecklenburg-Vorpommern (about € 120,000 in 2019) were used mainly to finance the Coordination Office of the P-Campus. Since 2014, the Coordination Office, located at the IOW, has consisted of two employees: a scientist and a secretary.

Since 2015, the P-Campus had an amount of € 1.2 million at his disposal, provided by the Leibniz Association, to be distributed over a period of 4 years to i.a. partially fund 11 interdisciplinary PhD projects. From June 2019 on, the Leibniz Association provides a total amount of € 1.13 million within the scope of the second funding period of the P-Campus.
APPENDIX
In the following, the activities and thematic foci of the Coordination Office of the Leibniz ScienceCampus Phosphorus Research Rostock in 2019 are described. The Office is staffed by Dr. Dana Zimmer (scientific coordinator) since mid-October 2018. The position of the administrative assistant was vacant since July 2019 and is staffed by Maxi Hoche since September 2019. The focus of the Coordination Office’s work was, as before, the coordination of the partner institutions and its individual members, research foci and projects, but additionally the successful organization of the start of the new funding phase of the Leibniz Association from June 2019 on.

Other tasks included i.a. the external representation of the P-Campus (e.g. Long Night of Sciences on 25 April 2019), the preparation of reports and emails providing information to interested parties, the organization of other events of different formats (e.g. lecture series during summer semester 2019 “Die Wege des Phosphors in der Umwelt und Möglichkeiten der P-Nutzung”) 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 P-Campus.

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, event organizer as well as its public relations tasks are described in detail.

**Contact point**

The Coordination Office of the P-Campus is the linchpin for networking, both within the P-Campus and externally, at national and international levels.

In 2019, the Coordination Office continued to serve as a contact for all members of the P-Campus, 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. Moreover, in 2019, the admission of so-called associated members to the P-Campus was organized (i.a. preparing application for admission and contract for associated membership). At the turn of the year 2019/2020, two contracts were prepared, so that one of them is circulating to be signed (University of Copenhagen) and the other one needs final details (Leibniz Institute for Agricultural Engineering and Bioeconomy (ATB)). Scientists of other research institutes, which deal with the topic phosphorus and are in close contact with regular members of the P-Campus, can become associated members. The admission of associated members conduces to an increasing external networking of P-Campus scientists and the internationalization of contacts. Contacts with external research institutes, ministries and authorities were regularly maintained (e.g. 11.12.2019 presentation of recent research results of the P-Campus to ministry members).

Due to the extension of the research clusters and since especially a gender-neutral orientation of the P-Campus should be experienced, as it is established in the guidelines of the Leibniz institutes and the University of Rostock, an extension of the
steering committee with the focus on applications of women was organized and successfully realized. Since April 2019 three more women are members of the steering committee of the P-Campus (Prof. Dr. I. Sokolova, PD Dr. D.-C. Fischer, Prof. Dr. B. Eichler-Löbermann).

Contacts to other networks were intensified, for example to the network Interdisciplinary Faculty (INF) and the DFG Graduate College Baltic Transcoast of the University of Rostock and by membership in the participation in meetings of the DPP. The organized DPP event at the faculty of agricultural and environmental sciences on the 22 August 2019 unfortunately could not take place because of too few participants (due to the long journey to northern Germany). The coordination of the P-Campus participated in the meeting of members and the forum of the DPP on 25-26 September 2019. On the 1 October 2019, the Leibniz ScienceCampus ComBioCat started as cooperation between the University of Rostock (Institute of Chemistry) and the LIKAT. During the fourth quarter, several meetings with representatives of this Campus took place, so that on the one hand, the new ScienceCampus could benefit from the experiences of the P-Campus and, on the other hand, to consider to what extent common events respectively cooperations are possible and sensible.

Research topics and initiatives
The P-Campus thrives on the continuous initiatives of its scientists in developing research themes and ideas and in considering proposals for their realization. A first tender for seed projects for the second funding period of the P-Campus was organized in May 2019. The funding of six new seed projects could be promised by the P-Campus with the official start of the second funding period in June 2019. Three of these projects can (partly) be allocated to the new cluster IV “Molecular Biology of P”. This successful concept of the seed projects is also borrowed and extended for the second funding phase from 2019 on. The next call for tender is planned for 2020/21.

To facilitate the application for seed projects, the assumption of travel and publishing costs but also the report of published publications and granted projects for the P-Campus members, old templates were improved respectively new templates were created. Since there are more foreign PhD students in the second funding phase, all forms and so on were translated into English.

Structured graduate support
As young scientists are a significant part of the P-Campus network, a structured framework for their support and encouragement is offered by the P-Campus. Furthermore, feedback from the PhD students of the first graduate school (2015-2018) as well as from other funded PhD students of the P-Campus was requested and evaluated and will be realized as changes in the second graduate school (e.g. extension in the supervision agreement, provision of a guideline for the new PhD students).

The Coordination Office is responsible for the coordination and administration of the new graduate school and will organize several events and other networking opportunities for the PhD students again. Since June 2019, the new PhD students are being gradually employed (last employment planned for June 2020). Since several PhD students were employed just in October respectively November 2019, the startworkshop ‘P analytics’ was organized for November 2019 (CW 48) and the P Breakfast was organized and supervised by the Coordination Office on the 17 December
2019. Some of the PhD students could already present their concept as poster or speech at the International P-Campus Symposium (12-13 Nov 2019 at IOW). The P-Campus also co-financed the participation in IPW9 (July 2019) and a research stay at the ETH Zurich (Nov 2019) for two new PhD students.

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 P-Campus.

Among the regular activities that took place in 2019 were the organization of meetings of the Steering Group of the P-Campus (including presentation of current developments, record keeping, etc.) and of breakfast gatherings of PhD students of the P-Campus, which promoted mutual exchanges. For that reason, a “P Breakfast” for (former) PhD students was organized in March and December 2019 to receive feedback and improvement suggestions for the new graduate school (see above). This very well adopted concept, which includes all PhD students (also the ones not being funded), shall be continued during the second funding phase. For the summer semester 2019 the lecture series “Die Wege des Phosphors in der Umwelt und Möglichkeiten der P-Nutzung”, consisting of six lectures, was organized and supervised by the Coordination Office. The first P breakfast with the new PhD students (and a few “older” ones) took place in December 2019 (as mentioned above), since around half of the PhD students were employed at this time. Furthermore, the P-Campus Symposium (compiling the program, invitation, catering etc.) took place twice in 2019; the first time in April 2019 including a presentation of the concept und topics of the new graduate school and the second time in November 2019 as international symposium with participation of the international scientific advisory council.

Public relations
The P-Campus 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 P-Campus at various events and in the media (articles, interviews). For this reason, e.g. a former PhD student of the P-Campus Graduate School was employed to write, in close collaboration with the Coordination Office, an article about the first Graduate School for the journal “Wasser und Abfall”. The article was published in October 2019.

Moreover, the development of information (handouts, posters, presentations) about the P-Campus is part of the tasks of the Coordination Office. That also means that members of the P-Campus are actively addressed to represent the P-Campus at interesting events (conferences, workshops etc.). Selected workshops and other small events are used to increase the level of awareness of the P-Campus and attract new members by offering P-Campus writing pads and flyers. The Coordination Office offers support related to introducing the P-Campus to external scientific groups, policy makers, authorities, and the general public through visual presentations, such as research posters.

Together with its PhD students, the P-Campus actively participated in the Long Night of Sciences at the University of Rostock. In April 2019, sources and ways of P in the
environment, the impact of P in nutrition on the (bone) health of farm animals and the impact of soil crusts and earthworms on the soil and the P availability were brought nearer to public. The coordination of the P-Campus presented the P-Campus with a poster at the open day of the IPK. The International Phosphorus Workshop (IPW9) took place in in Zurich in July and the annual meeting of the German Soil Science Society (DBG) took place in Bern in August. The coordination of the P-Campus presented the P-Campus (with the new research topics and the second graduate school) with a poster at both events. Moreover, the coordination office organized the visit of partner institutes of the P-Campus (presentations and guided tours at FBN, AUF and IOW) for journalists of the German Science Journalists’ Association on 24 and 25 September 2019 within the scope of their research trip “Phosphorus – and the future of agriculture”. One of the journalists published an article about the visit at the P-Campus in January 2020 in the journal ‘Nachrichten aus der Chemie’ (Osterath, B. “Ressourcmanagement – Ein paar Schippchen weniger”). Prof. U. Bathmann (as spokesman of the P-Campus) and two members of the scientific advisory council of the P-Campus took part in the event “Die Zukunft der interdisziplinären Forschung” (Engl. ‘the future of the interdisciplinary research’) within the scope of the 600 years anniversary of the University of Rostock in November. They held a presentation and participated in the panel discussion on the subject of ”Begrenzte Ressourcen und wie wir mit ihnen umgehen sollten” (Engl. ‘limited resources and how we should handle them’). A journalist of the NDR attended the International P-Campus Symposium on 12 November 2019. A TV report about the symposium and the research of the P-Campus was broadcasted as part of the ‘Nordmagazin’ on 15 November 2019. The coordination office presented the P-Campus and its new graduate school with a poster at the Research Camp of the University of Rostock on 21 November 2019.

The coordination office also compiles information about the P-Campus (handouts, posters, presentations). Furthermore, members are directly addressed in order to present the P-Campus at thematically interesting events (conferences, workshops etc.). The P-Campus uses selected workshops and small events to increase the awareness level of the P-Campus and acquire new members by providing P-Campus notepads and leaflets. For example, the Antarctic workshop on 3 and 4 June 2019 (organized by P-Campus members) was provided with ballpoint pens and notepads. The Botanists Meeting (15-19 Sept 2019, also organized by P-Campus members) was also financially supported to increase the awareness level of the P-Campus. In this sense, the coordination office supports the members to present the P-Campus to extern scientist groups, policy, authorities and the general public in the form of presentations (slides) and posters.

Another important task was the design of the website of the Leibniz ScienceCampus Phosphorus Research Rostock, including content development, in coordination with relevant scientists. In 2019, the website had to be comprehensively edited due to the start of the second phase of the P-Campus. The website is updated continuously with new information from the P-Campus (e.g. new publications, P relevant events). The coordination office also compiles texts and information that allow the presentation of the P-Campus on other websites (for example, those of the DPP and the ESPP).
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