Universität Bremen

MAPEX Center
for Materials and Processes

PROGRAMME

14th MAPEX Early Career Researcher Workshop

SCIENCE MEETS INDUSTRY
cooperation projects and career path in(to) the industry

14th February 2023
AIB building (Hochschulring 40)

14 MAPEX
Materials Methods Technologies
Early Career Researcher Workshop

MAPEX Bremen

Programme overview

8:30	**Registration**
Session 1	
9:00	**Welcome and introduction** Enis Bicer, Hanna Lührs
9:15	**Career talk 1: Aquafarming the open ocean** Dr. Mar Fernández-Méndez *Co-founder of Seafields, Lead Helmholtz Young Investigator Group Polar Biological Oceanography, AWI Bremerhaven*
10:00	**Laser based surface modifications** Dr. Tim Radel MAPEX Early Career Investigator *BIAS - Bremer Institut für angewandte Strahltechnik GmbH*
10:30	**Coffee break and discussion**
Session 2	
11:00	**Towards optical cavities based on Gallium Oxide** Dr. Manuel Alonso-Orts MAPEX Early Career Investigator *Institute of Solid State Physics, University of Bremen*
11:30	**Panel discussion 1 - Moving from academia to industry** with Dr. Mirko Christ, *OHB System AG* Dr. Valentin Baric, *ArcelorMittal Bremen GmbH*
12:15	**Career talk 2: Learning from the best - Insect biomechanics for bioinspired solutions** Prof. Dr. Jan-Henning Dirks *Biomimetics-Innovation-Centre* *Hochschule Bremen - City University of Applied Sciences*

13:00	**Lunch break and discussion**

Session 3	
14:00	**BRIDGE supporting start-ups from Bremen Universities** Jeroen Langejan *BRIDGE, UniTransfer, University of Bremen*
14:15	**Panel discussion 2 - Starting a company from academia** with Dr. Andreas Grund Founder & Advisory Board *GCP-Service International Ltd. & Co. KG* Dr. Martin Holi Senior Business Advisor *TOPAS Industriemathematik*
15:00	**Coffee break and discussion**

15:30	**End of programme**

17:00	**Social event** **Black light mini golf at SchwarzLichtHof** Cuxhavener Str. 7, 28217 Bremen (directions on page 12)

Organizing committee

Hanna Lührs, Enis Bicer, Subrina Jahan, Britta Hinz

Session 1

09:00 **Welcome and introduction**

Hanna Lührs, Enis Bicer
MAPEX Center for Materials and Processes

09:15 **Career talk 1:**

Aquafarming the open ocean

Dr. Mar Fernández-Méndez

Co-founder of Seafields and

Lead Helmholtz Young Investigator Group

Polar Biological Oceanography, AWI Bremerhaven

Farming the open ocean to produce seafood and raw materials will reduce pressure on coastal natural ecosystems and their biodiversity, while providing economic growth and employment in the global South. In addition, the combination of seaweed aquafarming with artificial upwelling in the subtropical gyres can contribute to ocean Carbon Dioxide Removal (CDR) at scale.
In this presentation I will talk about the innovative approach proposed by Seafields to establish seaweed farms in the oceans' deserts by irrigating them with nutrient-rich deep water. *Sargassum fluitans* and *natans* grow naturally floating in the ocean doubling its biomass every 14 days when provided with enough nutrients. *Sargassums* very high carbon to nutrient ratio (34), makes it ten times more efficient at carbon capture than phytoplankton. Sargassum biomass, harvested with solar powered autonomous drones, can be processed to extract high-value and fossil-fuel replacing products (eg. fertilizers, emulsifiers, bioplastic, biofuel..) and the remaining carbon-rich biomass compressed into bales to slow down microbial breakdown on selected sites of the abyssal plain.
The aquafarms will be initially located in the Caribbean using the excess nutrients in those waters, and later will be expanded towards the largest unused spaces of the planet: the subtropical gyres, where upwelling of nutrient-rich deep water will be achieved by harnessing the density gradients in the water column. Deep cold nutrient-rich water will rise in thin-walled inner pipes by warming them with high-salinity, surface water. The Sargassum aquafarms will not only contribute to long-term carbon sequestration, but also serve as a habitat for high-protein crustaceans and as nursery for fish, increasing oceanic productivity and benefiting open ocean fisheries.

My current role: I lead a research group at the Alfred Wegener Institute in Bremerhaven looking into carbon and nutrient cycling by micro and macroalgae in the ocean. I also co-founded a company to develop Sargassum open ocean aqua farming called Seafields Solutions. I am their Lead Scientific advisor.

Describing my daily work in one sentence: Either sitting in front of the computer for 8-9 hours writing proposals, manuscripts, preparing presentations and having meetings, or at see taking samples, snorkelling, analysing samples in the lab, talking to my team, organising logistics, visiting other countries.

Major milestones of my career: Having the luck to work with inspiring mentors like Victor Smetacek, Antje Boetius, Philipp Assay and Ulf Riebesell, and becoming independent by getting the funding for my own research group, hiring my own team and winning the SPRIN-D Carbon to Value Challenge.

10:00 Laser based surface modifications

Dr. Tim Radel

BIAS - Bremer Institut für angewandte Strahltechnik GmbH

An overview of different laser processes for surface modification is given. Among others, laser ablation, laser polishing, and laser-induced periodic surface structures (LIPSS) are presented to influence the properties of the surface.

My current role: Head of department laser processing

Describing my daily work in one sentence: Lead a highly motivated team of young research associates to gain new exciting insights into laser processes.

Coffee break 10:30 – 11:00

Time for discussion

Session 2

11:00 Towards optical cavities based on Gallium Oxide

Dr. Manuel Alonso-Orts

Institute of Solid State Physics, University of Bremen

Gallium oxide is an emerging ultra-wide band gap (UWBG) semiconductor which has lately attracted a large amount of scientific interest due to its high electrical, optical and thermal stability, along with the ability of large-scale native substrates [1]. Furthermore, the wide transparency range of the material allows its optical emission to be tuned from the IR to the near-UV depending on the optically active ion used as a dopant, which adds an extra value to the potential of this oxide.

In this talk, I will present some of my work related to this material as a junior postdoc of the Solid State Materials group at the University of Bremen. The aim is to overcome the technical challenges related to the UWBG system by establishing and applying novel fabrication methods and designs for visible and near-UV optical cavities based on epitaxial Ga_2O_3.

Firstly, the optical emission of Ga_2O_3 is explored by micro-photoluminescence (μ-PL) spectroscopy of annealed Ga_2O_3 thin films. Secondly, to improve the confined light in an optical cavity, different kinds of tuneable mirrors have been designed and tested. Either Focused Ion Beam (FIB) milled periodic holes [2] or Atomic Layer Deposition of thickness-controlled layers on the microwire ends give rise to Distributed Bragg Reflectors (DBRs) which act as mirrors in such cavities. The optical resonances that arise can be tuned from the near-IR to the near-UV depending on the presence or absence of the optically active ion Cr^{3+} [2, 3]. The use of FIB-fabricated Ga_2O_3 optical microcavities as wide range thermometers has been recently demonstrated [3]. Still, much work is required to tune and optimize both the optical emission and the light confinement in these optical microcavities.

[1] J. Zhang, J. Shi, D. C. Qi, L. Chen, and K. H. Zhang, APL Materials, **8**, 020906 (2020).

[2] M. Alonso-Orts, G. Chilla, R. Hötzel E. Nogales, J. M. San Juan, M. L. Nó, M. Eickhoff, and B. Méndez, Optics Letters **46**, 278-281 (2021).

[3] M. Alonso-Orts, D. Carrasco, J. M. San Juan, M. L. Nó, A. de Andrés, E. Nogales and B. Méndez, Small **18**, 2105355 (2022).

My current role. Junior postdoc at the Solid State Materials group (AG Eickhoff) of the University of Bremen.

Describing my daily work in one sentence: Office and lab work related to the synthesis and characterization of gallium oxide and related materials.

Major milestones of my career:

- Second prize at the "Master Thesis Award", Held at the Federations of Materials Sciences (FEMS) Junior Euromat in Budapest (June 2018).

- PhD Thesis with honours at the Complutense University of Madrid, titled "Architectures based on Ga_2O_3 micro- and nanowires with applications in photonics" (October 2020).

- 6 first author peer-reviewed publications in high impact journals. The latest one, in the renowned journal *Small* reports the demonstration of a wide dynamic range thermometer based on luminescent optical cavities in Ga_2O_3:Cr nanowires.

11:30 **Panel discussion 1:**
Moving from academia to industry

Dr.-Ing. Valentin Baric
ArcelorMittal Bremen GmbH.

My current role: I am Model Expert Process Models at the Simulations and Models group within the Department of Automization, Industrial IT and Models at ArcelorMittal Bremen GmbH.

Describing my daily work in one sentence: Apart from the inevitable project management I enjoy applying my knowledge in process engineering (e.g., thermodynamics, chemistry), statistics and coding (Python, C#) to develop and deploy process and optimization models that are exploited by process operators 24/7.

Major milestones of my career: PhD (2019), Coordinator of the models for decarbonization at ArcelorMittal Bremen GmbH.

Dr.-Ing. Mirko Christ
OHB System AG

My current role: I am the Project Manager for one of the major OHB-built subsystems in two satellite programs. The System includes both ground and space-based units so I'm constantly in contact with stakeholders across the entire company, to suppliers and government agencies.

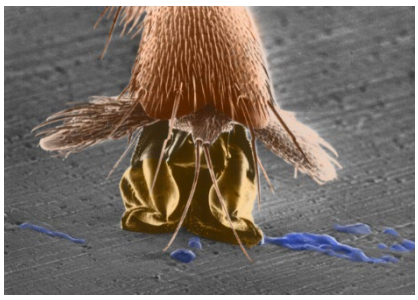
Describing my daily work in one sentence: Knowing at any time what everyone is doing (and telling it to whomever needs to know).

Major milestones of my career: Studied aerospace engineering (Diploma) at the TU Braunschweig (2004-2010), doctoral degree in 2016 at the University of Bremen. In science, my highlight was to develop a novel test device all the way to the state of serial production together with other colleagues from universities and the industry. In my new role in the industry, it was seeing "my" unit being integrated into the satellite hardware in the clean room.

12:15 **Career talk 2: Learning from the best - Insect biomechanics for bioinspired solutions**

Prof. Dr. Jan-Henning Dirks

Biological Structures and Biomimetics, Biomimetics-Innovation-Centre, Hochschule Bremen - City University of Applied Sciences



Although arthropods and in particular insects can be considerer as one of the evolutionary most successful groups of animals, only very little attention has been paid to the biomechanical properties of their cuticle exoskeleton.
In my presentation I will discuss several biomechanics examples to illustrate the fascinating correlation of material properties and morphology in insects and the efficient use of cuticle as an exoskeleton biomaterial.
Understanding such correlations can be an important tool in understanding the evolutionary "secrets of success" and at the same time a great source for bio-inspired technology.
Image: ESEM image of an ant foot with adhesive liquid. Reference: https://doi.org/10.1039/c1sm06269g

My current role. Since 2016 I am head of the Biological Structures and Biomimetics Workgroup at the Hochschule Bremen.

Describing my daily work in one sentence: My daily work combines research on a wide variety of fundamental and applied research topics with quite a bit of teaching – pretty much every day is unique, interesting and challenging

Major milestones of my career: Before my time in Bremen, I was leading an independent research group at the Max-Planck-Institute for Intelligent Systems in Stuttgart, a scientist at Procter&Gambles R&D headquarter in Frankfurt, a postdoctoral researcher at Trinity Colleg Dublin in Ireland and a PhD student at the Department of Zoology in Cambridge, UK.

Lunch break 13:00 – 14:00

Snacks for lunch will be served

Session 3

14:00 BRIDGE support for start-ups from Bremen Universities

Jeroen Langejan
BRIDGE, University of Bremen

BRIDGE is the central contact point for startup-related matters for students, alumni, and members of the universities in Bremen. The sponsors of the BRIDGE university network are the University of Bremen, Bremen City University of Applied Sciences, the University of Applied Sciences Bremerhaven, Constructor University, and Bremen Aufbau-Bank GmbH. BRIDGE aims to improve the entrepreneurial climate at all participating universities and to promote promising ideas with startup potential at an early stage. Further information about BRIDGE as well as our contact details can be found here: https://www.bridge-online.de/

14:15 Panel discussion 2:
Starting a company from academia

Dr. Martin Holi
TOPAS Industriemathamatik

My current role: Senior Business Advisor at TOPAS Industriemathematik, a spin-off from the Zentrum für Technomathematik (ZeteM) at the University Bremen located in the Digital Hub Industry

Describing my daily work in one sentence: Being a business wizard with numerous tasks such as providing business advice, conducting business analysis, running corporate communications (incl. website and social media) and marketing, networking, project management, creating a social workplace, igniting start-up spirit, senior role model and much more.

Major milestones of my career: Diploma in Business Studies (Mainz), Doctoral degree in entrepreneurship (EBS Universität), over 20 years of startup experience in financing, managing, researching, supporting, starting, teaching and working, incl. six years abroad in Cambridge (UK).

TOPAS Industriemathematik (industrial mathematics) is a research and transfer organisation and spin-out from the University of Bremen with expertise in mathematics, software development and development engineering used for optimisation in autonomous systems, digital twins, energy management systems and technical plants.

Dr. Andreas Grund
GCP-Service International

My current role: Advisory board member, consultant, trainer, investor, business angel

Describing my daily work in one sentence: My daily work contains the following components thinking, planning, learning, trying, failing, improving, re-starting, succeeding and teaching.

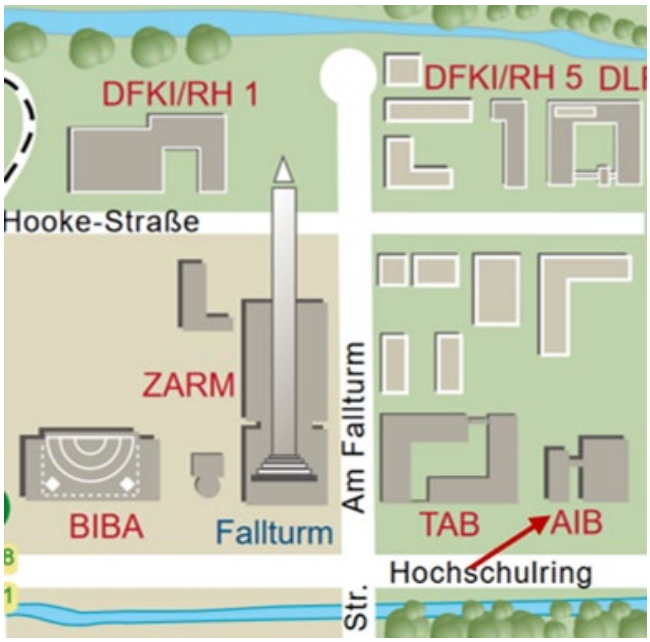
Major milestones of my career:
1999: PhD Nutritional Science, summa cum laude (CAU zu Kiel, Germany)
1999: Start in the industry at Omnicare Clinical Research (US company)
2001: Change to Inveresk Research (Scottish company)
2004: Foundation of GCP-Service International (Contract Research Organization)
2014: Foundation of AICROS (Association of International CROs)
2017: Merge with a Czech CRO (Leading CRO)
2018-2022: Opening of 5 additional offices in EU
06.2022: Handover of CEO and AICROS president role to next generation

GCP-Service International is a Contract Research Organisation (CRO), which conducts clinical trials for the pharmaceutical and med-tech industry in order to provide patients with new and better treatments.

Coffee break 15:00 – 15:30

Time for discussion

Venue of the workshop



AIB building

Hochschulring 40

28359 Bremen

1st floor

Location of the social event

17:00 SchwarzLichtHof Bremen

SchwarzLichtHof Bremen

Cuxhavener Straße 7

28217 Bremen

Directions:

Bus 28: From Universität Nord towards “Überseestadt” / stop “Überseetor” / 4-minutes walk. E.g. the Bus leaving at 16:21 from Universität-Nord (arrival 16:50).

Tram 3: From the city centre towards "Gröpelingen" / stop "Waller Ring" / 5-minutes walk along Waller Stieg in the direction of "Speicher XI".

Bus 26: From “Hauptbahnhof” towards “Überseestadt” / stop "Waller Ring" / 5-minutes walk along Waller Stieg in the direction of "Speicher XI".

MAPEX
Doctoral Qualification Programme

MAPEX seeks to support doctoral students in their personal development of professional and interdisciplinary skills and competences. Therefore, MAPEX provides a milestone-based programme that covers a comprehensive set of different qualification areas. Specifically, the programme offers the following benefits to its participants:

- Receive a transcript of records summarizing your achieved qualifications.
- Benefit from individual consultation and support with regard to your doctoral process and your personal competence objectives.
- Get a comprehensive overview about training courses and workshops offered by various institutions at the University of Bremen
- Take part in workshops organized by MAPEX and the Qualification Programme, which are specifically designed and oriented towards early career researchers.
- Benefit from MAPEX funding opportunities promoting your research activities (see next page).

For contact and further information visit the website:

MAPEX Bremen
Material. Process. Excellence.

MAPEX
Core Facility for Materials Analytics

A unique combination of cutting-edge instruments for the structural and chemical characterization of materials is being established within the University of Bremen by MAPEX in the form of the **MAPEX Core Facility for Materials Analytics (MAPEX-CF)**.

As a user facility, the MAPEX-CF allows scientists from several disciplines to share and access a wide range of high-performance scientific equipment in the investigation areas of **Electron Microscopy**, **3D Materials Analytics**, **Surface Analytics**, **X-ray Diffraction**, and **Spectroscopy**.

Funding

MAPEX and the MAPEX-CF also support Early Career Researchers by providing **funding** for short-term **research projects**, **materials analysis**, **workshops**, and **more**.

Research grants for Early Career Researchers:

Contact and more information:

MAPEX

MAPEX-CF

Notes

Universität Bremen

MAPEX Center
for Materials and Processes

14th MAPEX Early Career Researcher Workshop

Under the motto **'Science meets Industry'** the workshops aims to give you the opportunity to interact with people who successfully made the transition from science to industry. The event will consist of moderated discussions with panellists who have embarked on different career paths outside the university. Talks and keynotes by Early Career and Principal Investigators will be offered, who will present their research and personal career path within and outside of academia. In between the sessions, there will be plenty of opportunities to get in personal touch and discussion with the speakers, panellists and peers.

University of Bremen
MAPEX Center for Materials and Processes
www.uni-bremen.de/mapex