

## II MAPEX CALENDAR 2018/2019

- 22 October** MAPEX General Assembly
- 25 October** 7<sup>th</sup> MAPEX Early Career Researcher Workshop – science meets industry
- 25 October** Excursion to the Airbus site and plant Bremen
- 1 November** MAPEX Lunch Meeting for Early Career Investigators
- 3 December** MAPEX Lunch Meeting for Early Career Investigators

2019

- 13 February** MAPEX Methods Workshop III – Mechanical Testing
- 29 April** 8<sup>th</sup> MAPEX Early Career Researcher Workshop
- 17 & 18 June** MAPEX Symposium

**More events, seminars, and talks related to MAPEX topics:**  
[www.uni-bremen.de/en/mapex](http://www.uni-bremen.de/en/mapex) > *what's new?* > *calendar*

## II IMPRINT/CONTACT DETAILS

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# NEWSletter



## II COOPERATION WITH THE GERMAN MARITIME MUSEUM

### What a Splinter of Wood Reveals about a Figurehead



*from left to right:*  
Carolin Hilker-Möll, Prof. Dr. Lucio Colombi Ciacchi, Prof. Dr. Sunhild Kleingärtner, Niels Hollmeier, Prof. Dr. Stefan Brüggerhoff.

Under the coordination of MAPEX, several scientists from Bremen contributed to a special exhibition in the context of the European Year of Cultural Heritage 2018: “Der Zahn der Gezeiten – Maritime Schätze unter der Lupe” at the German Maritime Museum (DSM) – Leibniz Institute for Maritime History in Bremerhaven. The exhibition aims to raise awareness of the preservation of cultural heritage and maritime history with a focus on conservation and restoration of

exhibits. The expertise of materials scientists can help reveal the history of objects and to develop solutions for preservation for future generations.

The “Carla” figurehead must have been under water for a long time – it probably sank and was salvaged as a relic. This was one of the surprising conclusions the scientists from the Bremen Institute for Materials Testing (MPA) drew from their analyses. Further findings of the materials scientists from IWT, FIBRE and MPA can be explored in the exhibition which ends 15 December 2018.

The synergy between MAPEX and the DSM is part of a long-term research cooperation with the aim of materials characterization and digital recording of the museum collection.

7<sup>th</sup> MAPEX ECR Workshop



Career opportunities beyond academia are in the focus of the upcoming ECR workshop, taking place on 25 October under the motto science meets industry - cooperation projects and career path in(to) the industry.

The workshop is dedicated to early career researchers (PhD and MSc candidates, post-docs) from the University of Bremen and surrounding institutions who would like to meet and get in touch with

- alumni of the University of Bremen now working in industry,
- scientists and industry partners working on cooperation projects,
- the knowledge and technology transfer unit of the University of Bremen,
- other early career researchers from the field of materials science.

As a highlight in the afternoon, an excursion to the Airbus site and plant in Bremen is scheduled.

Neighbour visit ZARM and drop tower

This was certainly one of the highlights of this years' early career researcher activities. After a short introduction into microgravity and the research activities at the ZARM by Martin Castillo (head of materials science at the ZARM), we had the opportunity to witness a drop experiment by the QUANTUS project group. During the subsequent tour to the top of the tower, guided by Martin Castillo and his co-workers Magdalena Thode and Julia Thielke, we enjoyed the unique panoramic view over the city.

Daniel Meyer new member of CIRP

During the general assembly of the International Academy for Production Engineering

(CIRP) in Tokyo, MAPEX member Daniel Meyer was elected as a new member. Furthermore, Ekkard Brinksmeier was appointed an honorary fellow on the basis of his long-standing merits. Daniel Meyer is the sixth MAPEX member accepted in CIRP and thus one of the 63 scientists representing Germany.

MAPEX Family Support

Accompanying person on business trips

Conference trips, journeys in order to perform special experiments or visits to cooperation partners are an essential part of scientific work. For parents of infants or scientists caring for relatives, these trips represent an almost insurmountable obstacle. MAPEX can contribute to the travel costs for an accompanying person taking care of the accompanying infant or contribute to the additional care costs at home.

Family care during MAPEX events

To facilitate the participation of young parents to MAPEX events that last until late in the afternoon, we offer childcare support. The support covers the payment of the familiar babysitter and, if necessary, help finding new help.

Please contact Hanna Lührs for more details prior to the event or trip.

MAPEX Postcard Collection – Research Highlights

Do you already know our MAPEX postcard collection? We regularly feature research highlights of our members on the MAPEX website and print postcards with pictures/figures from the respective publications. Suggestions for research highlights and postcard motifs are very welcome. Please contact Hanna Lührs.

|| METHODS WORKSHOP II

Computational Materials Science

The “simulation toolbox at the University of Bremen” was in the focus of the second MAPEX methods Workshop taking place on 17 May 2018. More than 40 experimental and computational researchers at all levels, from master students to professors met in the TAB building in order to get an overview about “Computational Materials Science in Bremen across multiple time and length scales”, as introduced by the MAPEX speaker Lucio Colombi Ciacchi. The following eight speakers provided a comprehensive overview about their different fields of expertise, ranging from the simulation of electrons in 2D materials, electrons and atoms at interfaces over the structural prediction of biomolecules to the simulation of fluid processes and the calculation of crystal plasticity. Lively discussions during lunch and coffee breaks demonstrated the huge potential for new ideas and collaborations.

This workshop was organized in cooperation with the Bremen Center for Computational Materials Science and the DFG Research Training Group QM<sup>3</sup>.



|| MAPEX SYMPOSIUM 2018

Process Monitoring

Process monitoring was the focus of this year's MAPEX Symposium, taking place on 18 and 19 June 2018 in the Haus der Wissenschaft in the city centre. More than 60 participants closely followed the manifold scientific programme. With Sybrand van der Zwaag (TU Delft), Erica Lilleodden (Helmholtz-Zentrum Geesthacht, picture), Raimund Horn (Hamburg University of Technology), and Jörn Viell (RWTH Aachen University) four external experts followed our invitation. Inspiring talks by Erica Lilleodden on “in situ micromechanical testing” and Andreas Fischer on “speckle-based in-process measurements” were the highlights of the first day with monitoring of manufacturing processes as the main topic. The contributions on the second day were mostly related to catalysis and spectroscopy as a tool for process monitoring. Besides the invited talks, 16 early-career researchers presented a brief overview of their work during flashlight sessions, inviting the audience for in depth discussion during the subsequent poster exhibition. Two special sessions were dedicated to interdisciplinary research projects that received an “impulse funding” from MAPEX in order to establish and foster new internal cooperation within the MAPEX community. After two days and more than 30 contributions, Kirsten Tracht closed the event with the final talk on “Monitoring of Trends”.



# INSTRUMENT DATABASE

## In-situ powder X-ray diffraction

### II LT/HT X-RAY POWDER DIFFRACTOMETER STADIMP

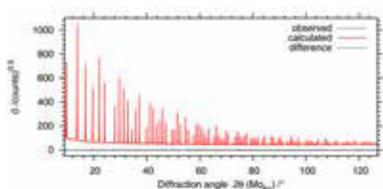


Figure 1: LaB6 Standard Reference Material (SRM), capillary transmission measurement.

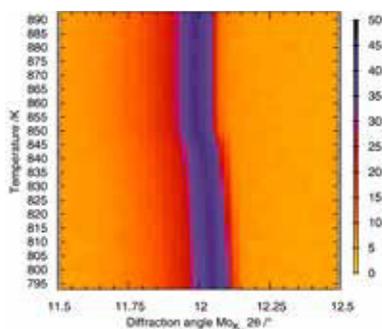


Figure 2: The (011) reflection of alpha-Quartz showing the phase transition to beta-Quartz at 847 K (in-situ HT2 high-temperature oven). Scattering data between  $13^\circ$  and  $21^\circ$   $2\theta$  were collected between 790 K and 890 K in 2 K steps (Data collection time 1.5 h, the square-root intensity is given).

X-ray powder diffraction in combination with the Rietveld method allows for structure determination of crystalline powder samples. The knowledge about the structure of a compound is the most important step to understand its physical and chemical properties. In combination with low- and high-temperature chambers, structure examination between 12 K and 1850 K is possible. This enables a deep understanding of the thermal-expansion behaviour as well as the examination of phase transitions. The high-temperature furnace, which can be used with reaction gases and in combination with the fast detector allows for the in-situ observation of reactions.

The diffractometer enables fast switching between transmission and reflection geometry. The samples can either be prepared in capillaries or as flat samples for transmission measurements in a Debye-Scherrer geometry or as flat samples for the Bragg-Brentano set-up. The short wavelength of the molybdenum radiation enables a screening of the reciprocal space to high Q – values, enabling even the calculation of low-resolution pair distribution functions (PDF) from the obtained scattering data.

## II LT/HT X-RAY POWDER DIFFRACTOMETER STADIMP

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### 01 II General Information

**Keywords:** X-ray powder diffraction, temperature-dependent structure characterization

**Categories:**

- Diffraction
- Structure characterization
- non-ambient X-ray powder diffraction (12 K – 1850 K)
- in-situ reaction studies (300 K – 1850 K)

**Main Application:** structure determination and refinement from temperature-dependent X-ray data

**Measured Quantities:** diffraction patterns

**Year of Fabrication:** 12/2017

**Manufacturer:** Stoe & Cie GmbH, Darmstadt

### 02 II Specifications

- Ge(111) monochromized Mo radiation
- Transmission (capillary and flat samples) and reflection geometry
- Dectris Mythen 1k linear detector ( $18^\circ$   $2\theta$  width) allowing for energy discrimination to suppress sample fluorescence and fast data collection for e.g. observation of reaction kinetics
- Stoe in situ HT2 heating chamber allows for application of different gases while heating (300 K – 1873 K)
- Oxford Cryosystems PheniX He-closed-cycle cooling chamber (12 K – 310 K)

### 03 II Contact

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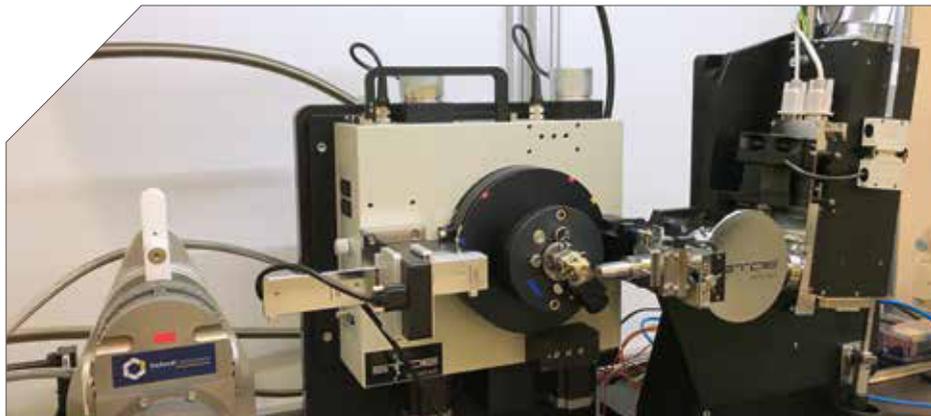
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# EDUCATION

## Schule in Farbigen Zuständen



### II ENSURING THE NEXT GENERATION OF MINT SPECIALISTS



Any Research is driven by people with curiosity, ideas, enthusiasm, endurance and perseverance; by people who break new grounds on unknown territories; with the tools of basic knowledge. But where do researchers come from and how do they obtain their skills to tackle important and yet unsolved problems? Although this is different for each individual, we are sure that we cannot start early enough to spark the flame. Our Collaborative Research Centre (CRC 1232 „Farbige

Zustände“) allows us to engage people from different scientific disciplines, at different stages in their career and from different cultural backgrounds in order to spark to our next generation. But how can we get this spark across to our future scientists, researchers, developers? Till what age are girls and boys open for new ideas and when do career aspirations consolidate?



**The approach:** Today there are two main established paths to engage young people: firstly, through programmes, e.g. the competition “Jugend forscht” (youth researches) for older children at an upper school level who have already received inspirations and made plans for their career. Secondly, through children who have had specific opportunities such as Girls’ and Boys’ Days, Childrens’ University (“Kinder Uni”) or open house workshops, etc. In our opinion, both paths seem to lack a

key point for a future concept: to start at an early age AND on a long-term-basis. This in mind, the CRC 1232 decided for a strong cooperation with a school close to the university, the Wilhelm-Focke-Oberschule (WFO) in Horn-Lehe, a junior secondary comprehensive school from grade 5 to 10, so-called Oberschule.

**The implementation:** Starting with a group of 28 fifth-graders in summer 2017, every week a WFO teacher and two CRC scientists give a two hour lesson together, organized in several 5-week modules. The project continues through the entire first funding period of the CRC while the children move from 5th to 7th grade, and our wish is, of course, to extend it to the 10th grade.

The themes originate from our interdisciplinary CRC, they offer new concepts and knowledge to the children. At the same time we provide links to their every-day-life as well as to their



regular technical and non-technical school subjects. The aim is to broaden the interest, arouse and support curiosity in technical topics. Regular hands-on practical exercises at school and at the university are an important element of the cooperation. For the children these visits at the university and the research institutes are always a highlight.

Table 1: Teaching modules for the 5th grade

Start and Name of Module	Area of discipline	School Subject
08/2017 ‚Werkstoffdetektive‘	Materials Science	Natural Science
11/2017 ‚Programmieren mit Arduinos‘	Computer Science	Mathematics
01/2018 ‚Metallzeit – Evolution durch Werkstoffe‘	Chemistry and Physics	Society and Politics (GuP)
03/2018 ‚Altmittel – Mach' was draus‘	Material Science	Economics, Labour & Technology (WAT)
05/2018 ‚Märchenhaftes Material‘ – Ein Videoprojekt	Media Technology	German

**Benefits and first results:** The benefit for the children is to receive a broad education with practical research experience and hands-on experiments. The teachers extend their expertise by working with scientists and getting access to the research environment and new topics. This joint cooperation requires open minds from all three partners: children, teachers and scientists. We could already see that all this is worth the effort: the regular evaluation of the teaching modules shows an increasing interest in technology and research among the children.

At the end of the first year’s programme, the children proudly presented their project work throughout all the subjects to their families, teachers and CRC-interns at the university. A “high-five” and a “we’ll see each other again in 8 years when I start studying at the university” was how the kids said good bye to the CRC-scientists of the teaching modules at the end of the year.



• • •  
**Farbige Zustände**

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