

## Newsletter Physics 04/22

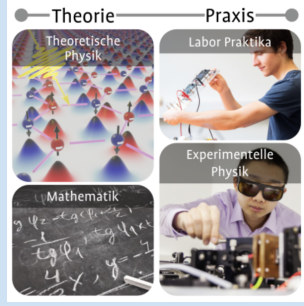
Department News    Research Highlights    Events    New colleagues



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### News from the Department



#### Updated homepage of the Physics Department

The PR group with a huge support from Andreas Schrimpf has started updating the homepage of the Department. The main changes include completely new landing pages for the panels Physics Studies and Research now summarizing the main advantages of studying physics and doing research at our Department. Surveys among students have shown that our homepage is the source of information number one for prospective students. Therefore it is of crucial importance to improve our homepage. Further adjustments will follow in the next weeks.

[Physics studies](#)

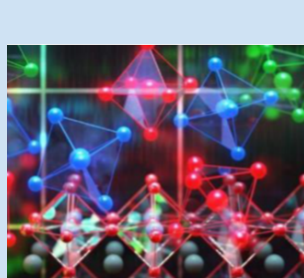
[Research](#)



#### New flyer of the Physics Department

The PR group has created a new department flyer. The aim of the flyer is to display the advantages of studying physics in Marburg and this way attract more students to our department. The flyer will be offered to students at different school events as well as to the interested public during the Tischlein-Deck-Dich event celebrating the 800 year anniversary of Marburg. If you would like us to send you some printed copies of the flyer, let us know.

[Flyer](#)



#### Digital School Event - presentations available online

The digital school event on 14/15th March was a success and was very well received by the schools. A total of 12 schools participated in the event. All presentations have been recorded and are now available on our homepage. The presentations have been kept simple to reach school students. If you want to know more about the broad research spectrum performed at our department, check out the presentations on neurophysics (Frank Bremmer), microplastics (Marina Gerhard), solar cells (Christoph-Jan Goldschmidt), organic electronics (Gregor Witte), and nanophysics (Ermin Malic).

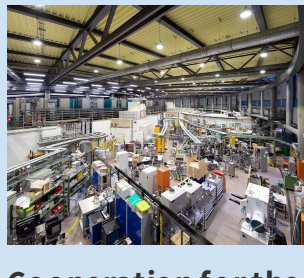
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#### SFB 1083 image posters

Two new image posters of the SFB 1083 were published. One of these addresses the general public giving information on the basic idea and research within the SFB. In addition, an overview of the participating groups and their subject area is given. The poster is available in German. The other one focuses more on giving a scientific overview over the SFB 1083. This includes common research topics as well as the used methods and techniques. The poster is available in English and addresses interested students and researchers.

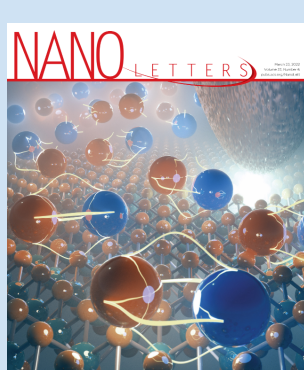
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#### Cooperation for the Synchrotron Beamline extended (AG Witte)

The He-SGM Dipole beamline at the electron storage ring of the synchrotron facility BESSY II in Berlin is operated by a consortium consisting of the Helmholtz-Zentrum Berlin für Materialien und Energie (HZB), Bundesanstalt für Materialforschung und -prüfung (BAM), Karlsruher Institut für Technologie (KIT), Ruprechts-Karls-Universität Heidelberg and Philipps-Universität Marburg. The University Marburg is represented by the group of Prof. Witte, which regularly uses this beamline to investigate molecular functional films and heterostructures by means of X-ray absorption spectroscopy (NEXAFS) and high-resolution X-ray photoemission. The cooperation, founded in 2017, has now been extended until the end of 2024, thus ensuring the realization of future synchrotron-based experiments, which play an important role in materials science research in the Physics Department.

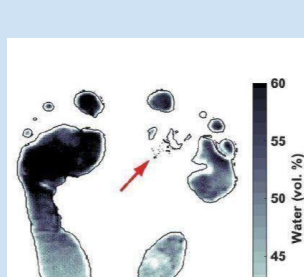
### Research Highlights



#### Ultrafast Nanoscopy of High-Density Exciton Phases (AG Malic)

The density-driven transition of an exciton gas into an electron-hole plasma remains a compelling question in condensed matter physics. In two-dimensional transition metal dichalcogenides, strongly bound excitons can undergo this phase change after transient injection of electron-hole pairs. In a joint experiment-theory study, AG Malic together with the group of Rupert Huber (University of Regensburg) has resolved how the Mott transition modulates over nanometer length scales, directly evidencing the strong inhomogeneity in stacked monolayers. Our results demonstrate how ultrafast polarization nanoscopy could unveil the interplay of strong electronic correlations and interlayer coupling within a diverse range of stacked and twisted two-dimensional materials. The work was published in **Nano Letters** and has been chosen for a supplementary cover.

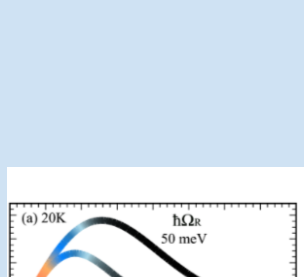
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#### Diagnostic potential of terahertz imaging for diabetic foot syndrome patients (AG Koch)

Diabetic foot syndrome, a long term consequence of Diabetes Mellitus, is the most common cause of non-traumatic amputations. Around 8% of the world population suffers from diabetes, 15% of diabetic patients present a diabetic foot ulcer which leads to amputation in 2.5% of the cases. There is no objective method for the early diagnosis and prevention of the syndrome and its consequences. In this article a team led by our guest professor Enrique Castro-Camus at AG Koch in collaboration with clinical institutions in Mexico show that terahertz imaging, which is capable of mapping the cutaneous hydration, has strong potential for the diagnosis of the diabetic foot deterioration. Furthermore, the analysis of the terahertz measurements combined with neurological and vascular assessment of the patients indicates that the dehydration is mainly related to the peripheral neuropathy instead of having a vascular cause, which is an open debate in the clinical community. The work was published in **Scientific Reports**.

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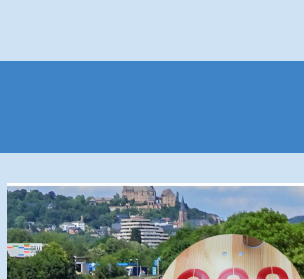


#### Exciton-polariton diffusion in 2D materials (AG Malic)

In the strong light-matter coupling regime, polaritons as hybrid light-matter quasi-particles are formed. The corresponding change in the dispersion relation has a large impact on optics, dynamics and transport behaviour of semiconductors. In this work, AG Malic has investigated the strong-coupling regime in hBN-encapsulated MoSe<sub>2</sub> monolayers focusing on exciton-polariton diffusion. Applying a microscopic approach based on the exciton density matrix formalism combined with the Hopfield approach, we predict a drastic increase of the diffusion coefficients by two to three orders of magnitude in the strong coupling regime. We explain this behaviour by the much larger polariton on group velocity and suppressed polariton-phonon scattering channels with respect to the case of bare excitons. The work was published in **Physical Review Materials**.

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### Events

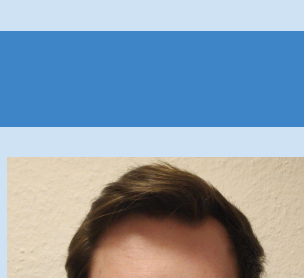


#### Anniversary 800 years Marburg (AG Malic)

The city of Marburg is celebrating its 800th anniversary this year, which is why a great interactive event called "Tischlein Deck Dich" takes place. There will be a long birthday table on the city motorway on Sunday the 5th of June (Pfungstsonntag). The Department of Physics will be represented at this event. Heinz Jänsch will perform some experiments supported by the PR team. If you would like to be a part of this event and bring new ideas of how to present the department, contact directly the PR team [pr-physics@physik.uni-marburg.de](mailto:pr-physics@physik.uni-marburg.de).

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### New Colleagues



#### Lukas Stock (AG Schrimpf)

After completing my bachelor thesis here in Marburg in the group of Prof. Schrimpf, I did my master thesis at the university of Heidelberg in the group of Prof. Andreas Quirrenbach. Since October 2021 I have been working on my PhD again in the group of Prof. Schrimpf.

I am working on characterization and radial velocity determination of high-mass stars and also on the development of data reduction software for echelle spectrographs. In my PhD I want to combine spectroscopic and photometric measurements to get a better understanding of these stars.

In my free time I am an active member of the management of a sport club and spent my time with reading or hiking.

### Share your good news

Your newsletter team: Carina Hlawaty, Maya Strobel, and Ermin Malic

Send us an e-mail with a short text and a nice photo to [newsfb13@physik.uni-marburg.de](mailto:newsfb13@physik.uni-marburg.de)

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