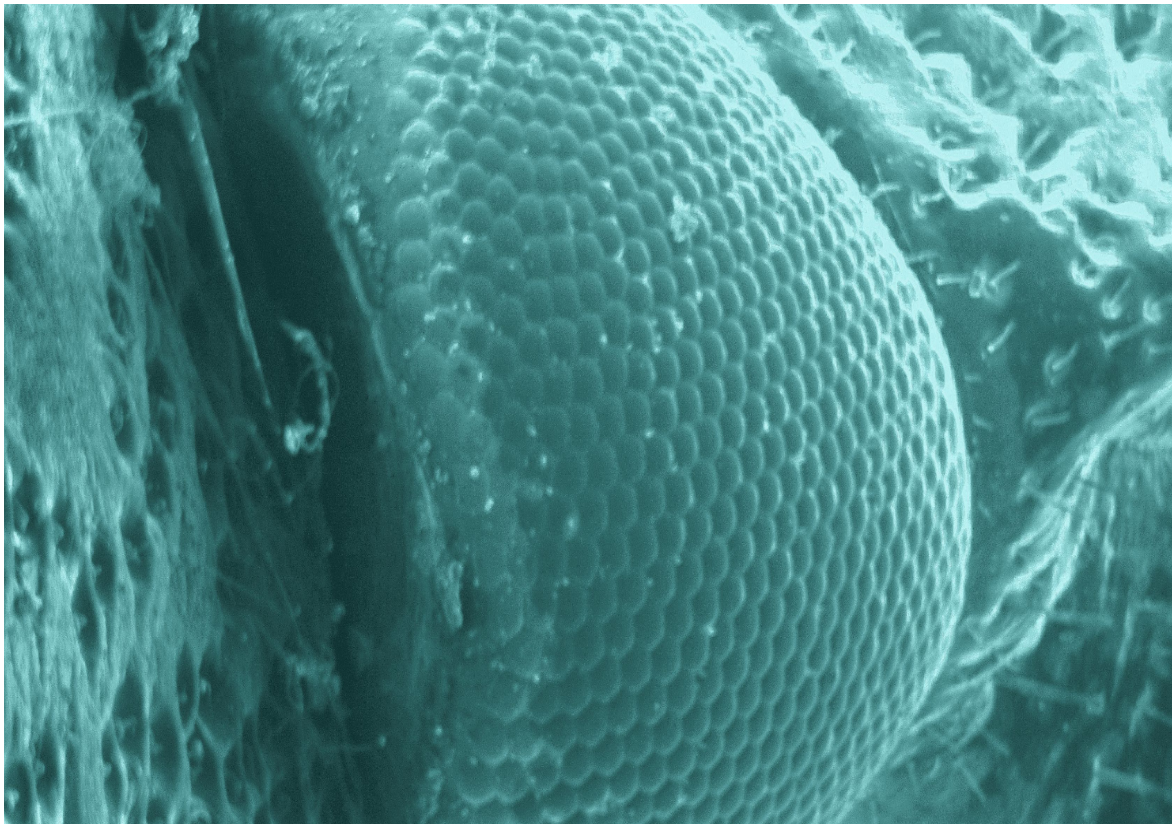
CINSaT Center for Interdisciplinary Nanostructure Science and Technology

Newsletter No. 17 (December 2024)



UNIKASSEL VERSITÄT

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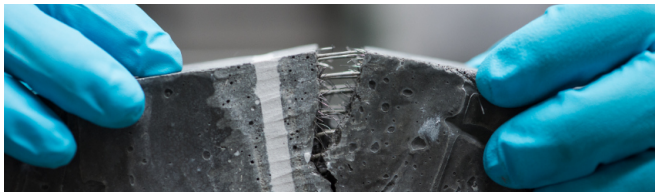
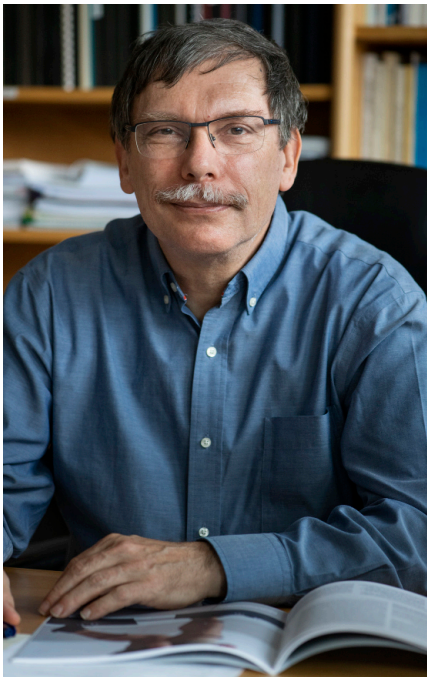


Cover Image
Compound eye of a Scutelleridae bug. Preparation was done by Florian Schnabel (Technological Physics).

Preface



Dear Reader,

Welcome to the second issue of the CINSaT newsletter for 2024. As the year comes to a close, it offers an opportunity to reflect on our activities and achievements. Over the past months, the CINSaT executive board and management have made significant progress in shaping the organizational framework for the future Nano Technology Center (NTC) and its associated key laboratories: Nanotechnology Lab (NTL) and Material Analytics Lab (MAL). Additionally, preparations for the application to extend CINSaT's mandate were finalized in December. Both the NTC plans and the application will be submitted to the university administration in early 2025, laying the foundation for further advancing Kassel's legacy in nanoscience and expanding its influence.

The CINSaT Autumn Colloquium took place on Wednesday, November 6th, and was met with great enthusiasm. The event featured four external speakers and attracted over 120 participants at its peak. With more than 70 poster contributions, this year's colloquium set a new record for participation. You can find a detailed report on the event, including highlights from the guest speakers' presentations and the poster award winners, in the Latest Reports section.

Much of this issue's content comes from our CINSaT member groups. In the New Projects section, Prof. Cyril Popov introduces his new BMBF project, "Diamond as Quantum Material" (DIAQUAM). This initiative focuses on utilizing color centers as quantum systems while developing scalable fabrication methods for commercial applications. The project is a collaborative effort involving DIATOPE GmbH, Helmholtz-Zentrum Berlin, and Ferdinand-Braun-Institute Berlin, with contributions from prospective end-users such as Robert Bosch GmbH and Advanced Quantum GmbH.

Prof. Bernhard Middendorf and Dr. Salah Uddin report on the second phase of their DFG-funded project, CEMBRIDGE-2. This research seeks to enhance our understanding of nucleation-driven cement dissolution reaction rates through gap-bridging multiscale modeling. In light of climate change and the environmental impact of concrete production, their efforts aim to improve the sustainability and efficiency of concrete production using advanced computational techniques to optimize cement dissolution mechanisms.

In the Research Highlights section, Prof. René Matzdorf and his PhD student Nico Kubetschek share their recent work on fabricating and modifying Au nanorods on Ge surfaces to explore correlated electronic behavior. As electronic systems are miniaturized, traditional models like the Fermi gas and Fermi liquid are no longer adequate. Mr. Kubetschek explains how nanostructures provide valuable insights into electron-electron interactions and correlated behavior.

In the New Members section, Dr. Andreas Hans introduces himself and his research in physics with synchrotron radiation. Dr. Hans joined CINSaT as a full member in October 2024, and we are delighted to welcome him to our community.

Finally, I wish you a successful year, good health and I hope you will enjoy reading of this issue.

Best regards,

Research Highlights

Fabrication and modification of nanorods as a model system

In basic solid-state physics, the electronic transport behavior observed in metallic and semiconducting bulk systems can be described using the model of the Fermi gas. Particle-to-particle interactions are not considered, and only the Pauli principle is considered. However, if weak interactions are to be incorporated, systems can often be adequately described using Landau's theory of the Fermi liquid, which introduces corrections such as the effective mass and a finite lifetime of states. When considering systems with confined dimensionality, it becomes evident that electron-electron interactions play an increasingly significant role, and the models of the Fermi gas and the Fermi liquid are no longer suitable. To gain insight into the charge transport behavior in low dimensions, it is essential to consider the influence of strong particle-to-particle interactions. Nanostructures on surfaces can be suitable model systems to investigate correlated electronic behavior. The advantage is that these can be accessed from the surface via scanning probe techniques and can be addressed individually and locally without averaging over an ensemble.

We have examined the fabrication and modification of Au and Co induced one-dimensional, defect-free nanostructures with high aspect ratios on the Ge(001) surface and found evidence for strong electron-electron interactions [1,2].

The Ge(001) surface exhibits an anisotropic twofold symmetric reconstruction, which serves as a promising substrate for the formation of one-dimensional nanostructures (Fig. 1a). This phenomenon is attributed to the presence of parallel dimmer rows, which are separated from each other by 0.8 nm (blue arrows).

The evaporation of 0.15 monolayers of gold results in the induction of defects that diminish the surface order (Fig. 1b). With the continued addition of Au, the surface reaches a highly disordered state (Fig. 1c). The evaporation of submonolayers of cobalt onto a clean Ge(001) surface results in the formation chains of hexagonal nanostructures following annealing at 700 K. These chains are composed of alternating A and B building blocks that are strongly oriented to the dimer rows of the substrate (Fig. 1d). The chains undergo structural alterations through the incorporation of gold (AAA sequences instead of alternating AB blocks), resulting in a notable increase in length (Fig. 1e). Monte Carlo simulations have demonstrated that the introduction of gold-induced defects facilitates the release of stress by loosening the dimer row template. The evaporation of additional gold results in the formation of nanorods exhibiting an internal periodicity of 1.11 nm, which is entirely incommensurate with that of the substrate (Fig. 1f). It has been demonstrated that these nanorods can manifest in two distinct forms: as a single rod or in pairs at varying distances from one another. The length distribution of these rods is broad, with a tail exceeding 100 nm. The electronic

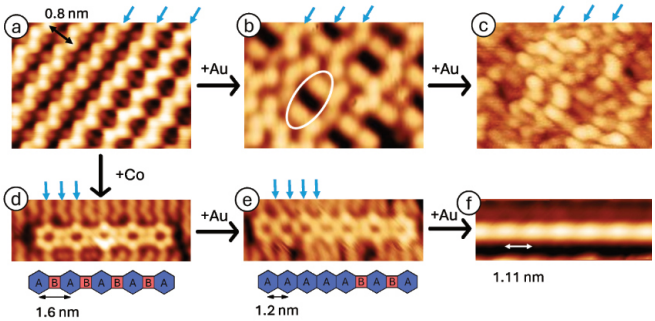


Figure 1: STM topographies of the ternary system Au/Co/Ge(001). Figs. (a-c) illustrate the Ge(001) surface reconstruction with increasing amounts of Au-induced dimer vacancies (white ellipse in b), which result in increased disorder. Figs. (d-f) depict self-assembled Co nanostructures grown on the pristine Ge(001) surface (d), with a small amount of Au-induced disorder (e) and with a larger amount of evaporated Au (f).

structure of the rods was examined locally using scanning tunnelling spectroscopy (STS), as illustrated in Fig. 2. The curves present the differential conductivity, which is proportional to the local density of states. As can be seen in Fig. 2a, four states are evident in the spectrum, two below and two above the Fermi energy (V = 0 V). These were fitted with a cumulative Lorentzian model (black curve).

The Lorentzian model demonstrates an excellent fit to the data, except for the region around the Fermi level, where a pronounced reduction in conductance is observed. Such a phenomenon, referred to as a "zero-bias anomaly," is indicative of correlated electronic behavior. Fig. 2b illustrates the fit curves of various models that could potentially generate a ZBA, superimposed on the residuals. As the analysis of more than 50 average spectra yields a comparable overall fit quality in the vicinity of the Fermi level, the underlying cause of the ZBA remains an open question. Nevertheless, the authors have demonstrated that the phenomenon is unequivocally present. The rods display high aspect ratios, a low defect density, and the distinctive hallmarks of correlated electronic behavior, thereby offering a potential model system for multi-tip STM investigations into low-dimensional charge transport.

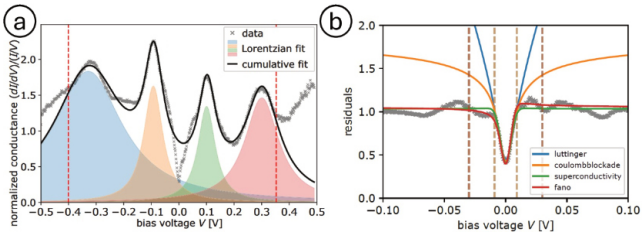


Figure 2: Electronic properties of the nanorods shown in Fig. 1f. Fig. a) depicts an STS spectrum (grey dots) and the fit curve (black line) assuming a cumulative Lorentzian model. Fig. b) demonstrates a discernible suppression around the Fermi level after the subtraction of the Lorentzian background. The colored curves represent fits of various ZBA models (Luttinger liquid: blue, Coulomb blockade: orange, superconductivity: green, Kondo resonance: red).

Further Information

[1] Johann Tonhäuser, Nico Kubetschek, Ulrike Kürpick, and René Matzdorf, Phys. Rev. B 106, 115404 (2022)

[2] Marcel Schlesag, Till-Jakob Stehling, Nico Kubetschek, Ulrike Kürpick, and René Matzdorf, Phys. Rev. B 110, 195412 (2024)

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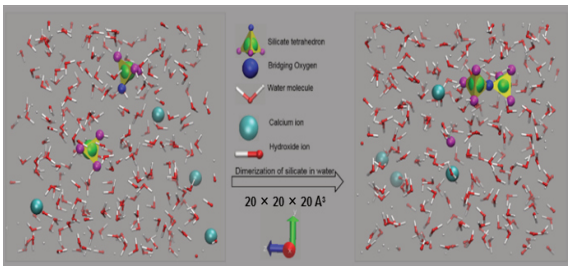
New Projects
CEMBRIDGE-2

Understanding Nucleation-Driven Cement Dissolution Reaction Rates by Gap-bridging Multiscale Modelling (CEMBRIDGE-2)

Concrete is the world's most used construction material and cement is one of the key ingredients of concrete, which is composed of mainly a solid mixture of different clinker phases. Given the current climate debate and the high CO2 emissions associated with cement production, significant improvements in the effectiveness and environmental performance of cement are required. Empirical studies alone are insufficient to achieve these quality improvements, as a better understanding of the underlying mechanisms controlling cement hydration reactivity is necessary to directly influence materials performance. Belite (ß-C2S) rich cement offers a sustainable alternative to Portland cement production. Belite has 220 kJ/t lower energy consumption and emits 10-15% less CO2 than alite production, but its lower hydration reactivity is a key issue that needs to be addressed. The initial "CEMBRIDGE" project funded by DFG aimed to develop a multiscale computational approach to understand cement dissolution by using molecular dynamics (Reactive Force Fields (ReaxFF), in combination with metadynamics) and upscaling kinetic Monte Carlo simulations. The results were reported on the far-from-equilibrium fundamentals of portlandite, C2S, and C3S dissolution. Thus, we successfully adapted the atomistic upscaling methodology for the highly complex cement minerals, enabling for the first time upscaling of the forward dissolution rates reaching a good agreement with diluted dissolution measurements. The second stage of the project, CEMBRIDGE-2, aims to investigate the concentration-dependent cement dissolution driven by (pre-)nucleation mechanisms that are considered crucial factors for the induction and main peak of cement hydration. The objective is to upscale atomistic simulations for dissolution rates governed by the pore solution saturation level coupled with the (pre)nucleation of hydration products. In addition to validating the model, experimental studies on the processing of C2S offer a promising approach to enhancing the sustainability of cement production. This CEMBRIDGE-2 project will investigate, both numerically and experimentally, the initial hydration rates of belite by developing an upscaled atomistic model for the dissolution-nucleation hydration mechanism, The upscaled atomistic model will enable us to simulate the combined effects of 1) dissolving (reacting) clinker crystallographic surfaces, 2) chemical composition of pore solution, 3) nucleation of hydrate precipitates in bulk and on cement surface, all combined into 4) a coupled dissolution/growth cement hydration model from fundamental reaction thermodynamic and kinetic perspective. To validate the developed computational approach, targeted experiments are required. Selected experimental procedures will characterize mineralogical and chemical inputs and their effects on the measured reactivity, specifically focusing on macroscopic reaction rates and microscopic changes in surface topology. Synthesis routes will investigate the effects of chemical dopants, sintering/quenching, and mechanochemical activation procedures.

To achieve the main objective, a multiscale model will be developed at different scales by the two groups of the University of Kassel (UniKs) and the Technical University of Darmstadt (TUDa). UniKs will couple a biased molecular dynamics (MetaD) model with a reactive force field (ReaxFF). The MD results provide the reaction energy barrier (activation energy, () and reaction Gibbs free energy () for each individual event scenario. Results will respectively feed to the KMC and CGMC upscaling models to calculate the overall rate of nucleation of CSH. The approach starts with an in-depth understanding of polymerization of silicates, Which is a building block of the formation of the CSH

a)



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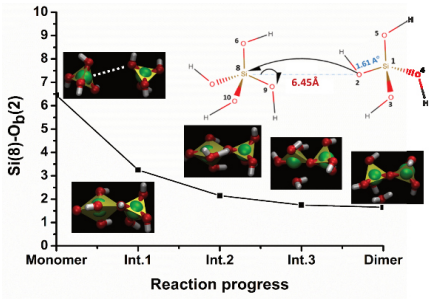

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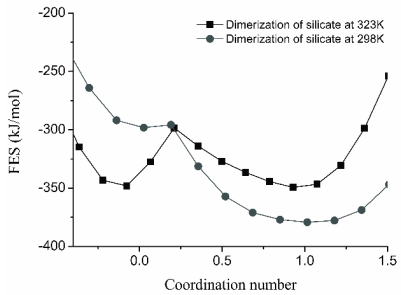

Figure 1: Si-O-Si bond formation during silicate dimerization in pore solution by MD: (a) Simulation snapshots. The equilibrium bond distance of Si(1)-O(2) and Si(8)-O(2) are given in Å; (b) Radial distribution function for Si(8)-Ob(2) pairs during the dimerization. (c) Free energy profile of dimerization of silicate in water at 298 K and 323 K.

pre-nucleus, that may form on the cement surface or in bulk solution.

The UniKs group has investigated the preliminary research on the dimerization of silicate in pore solution. The of 2.40 kJ/mol and of -81.00 kJ/mol indicating the possibility of spontaneous dimer formation at 298K. Similar approach will be used to compute the polymerization of silicates under the influence of external parameters i.e Ca/Si ratio and pH (11.5 and 14.0). The calculated rate constant of all atomistic reaction steps will be provided to TUDa group for developing the upscaled model using a kinetic Monte Carlo (kMC) method. Multi-body interactions (and) would enable drawing a definitive conclusion on the nucleation mechanism. The TUDa group has recently developed an improved 3-D off-lattice Coarse-Grained Monte Carlo (CGMC) computational tool in Matlab to simulate the nuclei structure of C-S-H, based on coarse grained unit interaction energy , solid energy and supersaturation (effect of concentration,).

Like CEMBRIDGE-1, the philosophy behind continuing the collaboration synergy is that atomistic MD and upscaling CGMC and KMC simulation tasks are done at different scale levels, led by the different applicants; UniKs, TUDa-Koenders and -Ukrainczyk, respectively. Moreover, complementary laboratory experimental program is proposed to validate numerical models. TUDa will perform C2S synthesis and characterisation measurements by laser granulometry, thermal analysis, SEM-EDS elemental mappings, isothermal calorimetry, and time resolved pore solution analysis (ICP), while UniKs measures changes of C2S surface during hydration by time- and space-resolved AFM (surface profiling), environmental SEM (EBSD and EDX), surface area by BET N2 adsorption, as well as quantitative mineralogical (QXRD) analysis.

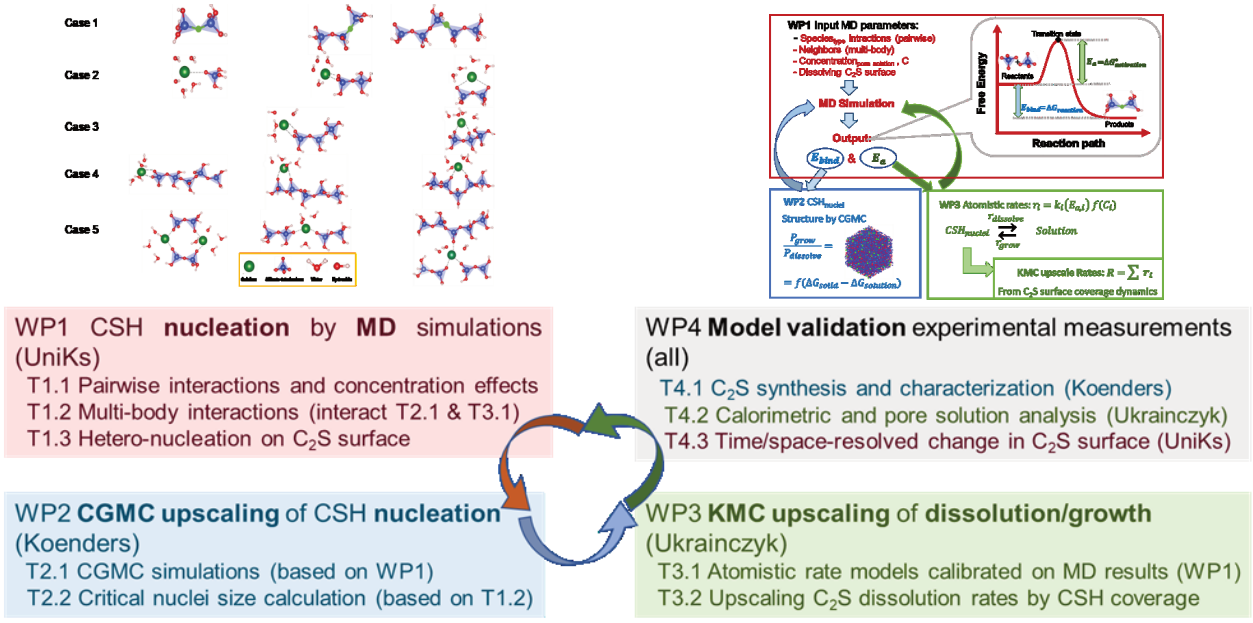

Figure 2. Computational approach and WP interaction synergy: MD (WP1) outputs provide binding and activation energies to feed WP2 and WP3, respectively. MD input scenarios are designed based on upscaling requirements. WP4 is model validation by the experiments.

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BMBF Project “Diamond as Quantum Material”

The color centers in diamond, point defects in the diamond crystal composed of an impurity atom (N, Si, Ge, Sn) adjacent to one or more vacancies (missing carbon atoms in the lattice), possess unique optical and spin properties. The possibility to manipulate and read out the electron spin even at room temperature makes the color centers one of the most promising systems for realization of quantum communication and networks, preparation of quantum tokens or development of high-precision nanoscale quantum sensors. Despite the increasing and extensive research on the properties and applications of the color centers in diamond, a decisive limitation is the availability of diamond with required specifications, mainly regarding its purity and crystal perfection. Probably this is due to the fact that monocrystalline diamond with low defect density can be grown only on diamond and not on another material. Furthermore, for my applications, thin diamond membranes with incorporated color centers are the material system required for the scalable production of quantum components.

In the DIAQUAM project commercially relevant methods for the scalable fabrication of diamond thin membranes and films with quantum quality will be developed. These thin films and membranes will be tailored regarding their purity, surface quality and incorporated color centers, so that they can find a broad application spectrum. In a next step, selected quantum technological and photonic components will be fabricated by nanostructuring of the functionalized membranes and films. To guarantee the suitability of the diamond membranes and components for quantum technology applications, DIAQUAM will use state-of-the-art quality control methods. Together with perspective end-users of diamond quantum components and devices, such as Advanced Quantum GmbH, QLIBRI, XeedQ GmbH and Robert Bosch GmbH, which are associated partners in the project, the developed materials and components will be tested, compared and improved for applications in quantum sensing, quantum communications and quantum computing.

The Federal Ministry of Education and Research (BMBF) is funding the project DIAQUAM with about 4.13 million euros over the next three years. Partners in the project are DIATOPE GmbH (project coordinator), Helmholtz-Zentrum Berlin für Materialien und Energie, Ferdinand Braun Institute Berlin and the University of Kassel. The group of apl. Prof. Cyril Popov at Technological Physics, INA, University of Kassel will contribute to the project in the field of diamond nanotechnology, including the preparation of diamond samples for implantation and functionalization with color centers, their surface modification and nanostructuring for fabrication of photonic components, nanopillars and nanoneedles for advanced quantum technology applications.

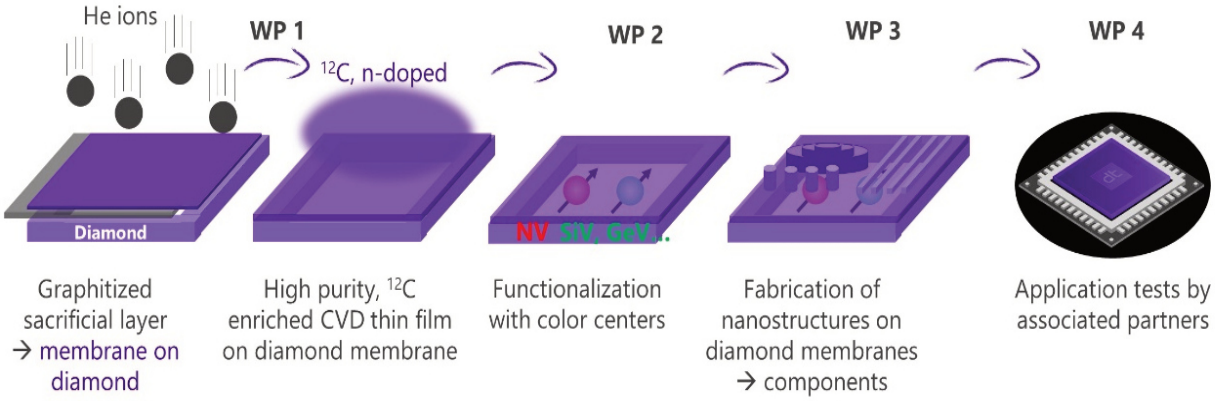

Figure 1: Planned workflow of the project DIAQUAM

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New Members
Dr. Andreas Hans

Andreas Hans completed his doctorate at the University of Kassel in 2018. After a postdoctoral stay at the University of Oulu, Finland, he returned to Kassel to take up a permanent researcher position in the Experimental Physics IV group. Since then, he has headed the subgroup “Physics with Synchrotron Radiation”.

Andreas' research interests include fundamental quantum mechanical phenomena in the interaction of ionizing radiation with matter. These include, e.g., interference effects in atoms and small molecules, molecular chirality and in particular interatomic/intermolecular phenomena in clusters and liquids after their electronic excitation with synchrotron radiation. He investigates how the response of matter to ionizing radiation changes when considering the transition from isolated atoms and molecules in the gas phase to small agglomerates of these particles (clusters) and finally to bulk matter. The focus lies on weakly bound matter, e.g. van der Waals clusters or hydrogen-bonded liquids. The special feature here is that the individual components largely retain their own electronic structure and still interact with each other.

Through their interaction, they can exchange energy and charge and open a variety of relaxation mechanisms between the particles, which have a decisive influence on the final quantum state of the system. When the excess energy is relatively low, low-energy electrons (LEEs) and radicals are usually generated. These particles are known for their ability to efficiently damage biomolecules, e.g., through DNA double-strand breaks. However, if the excess energy is large, as is the case for example with electronic vacancies in the inner shell, non-local energy dissipation can significantly influence the final charge state and thus control the fragmentation dynamics of molecules.

In a recent study, Andreas' group was able to identify a “radiation damage cycle” of solvated inorganic ions. In this example, solvated Mg2+ ions were ionized by X-rays and were found to decay through a cascade of intermolecular processes, including interatomic Coulombic decay (ICD) and electron transfer-mediated decay (ETMD). Both mechanisms produced the aforementioned (LEEs) and H2O+ radicals. One particular result was that the Mg ion regains its original state and is ready for another ionization event. In this way, solvated ions can become hotspots for radiation damage.

For their research, Andreas' group uses the unique properties of soft X-rays from large-scale light-source infrastructure across Europe. The working atmosphere at such international and interdisciplinary institutions is stimulating and inspiring. In this environment, the group mainly uses multi-particle coincidence techniques and has developed a worldwide unique spectrometer for the simultaneous detection of multiple electrons and optical photons.

Visionary, the research on the fundamental interactions between X-rays and matter should contribute to a better understanding of radiation damage at the molecular level and thus improve radiation protection and medical therapies. This vision is summarized in Fig. 1, which outlines the experimental technique of spectroscopy of X-ray irradiated liquid samples and its implications for radiation chemistry.

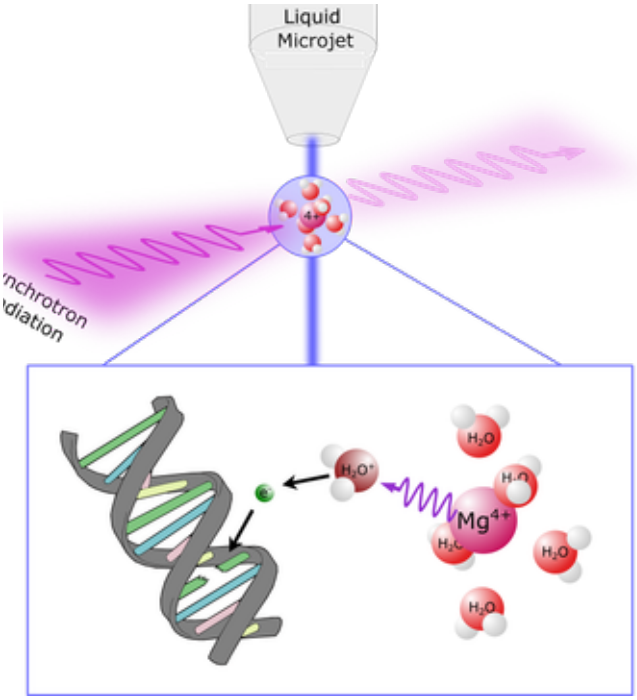

Fig. 1: Sketch of a typical experimental scheme to explore inter-particle energy transfer in aqueous solutions. The reaction products are relevant for radiation chemistry on a molecular level and may, e.g., cause severe damage to biomolecules in living organisms.

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Latest Reports

NEWS: Bruker MALDI-TOF/TOF mass spectrometer

A Bruker MALDI-TOF/TOF mass spectrometer including a bundle for molecular imaging analysis will be available soon at FB10.

Acquisition of a new Bruker MALDI TOF/TOF mass spectrometer including an application platform for imaging mass spectrometry has been approved with the funding amount of 630,000.00 € by the German Research Foundation as part of the Major Research Instrumentation Programme according to Article 91b of the Basic Law (Forschungsgroßgeräte nach Art. 91b GG). The responsible applicant and contact person is PD. Dr. Susanne Neupert, Institute of Biology, Department of Animal Physiology/ Neuroethology. Co-applicants are Prof. Dr. Georg Mayer (Zoology), Prof. Dr. Monika Stengl (Animal Physiology/ Neuroethology), Prof. Dr. Kirstin Gutekunst (Molecular Plant Physiology), Prof. Dr. Friedrich Herberg (Biochemistry), and Prof. Dr. Rudolf Pietschnig (Chemical Hybrid Materials), all of whom are members of CINSaT. The new instrument will be housed in the Department of Chemistry (Prof. Dr. Rüdiger Faust), while the sample preparation platform for imaging mass spectrometry will be available in the Neupert laboratory, Animal Physiology/ Neuroethology.

The mass spectrometry-based platform is scheduled for delivery in Summer 2025 and will be implemented in a variety of research projects (Fig. 1). These include: (1) Functional analysis of coupling factors controlling circadian (sleep-wake) and ultradian cycles (feeding) in the fruit fly Drosophila melanogaster by single-cell mass spectrometry (Neupert group); (2) neuropeptidomics of the circadian clock in onychophorans and tardigrades (Mayer & Neupert groups); (3) cellular and molecular mechanisms of neuronal plasticity in the insect circadian clock controlling sleep-wake cycles in different photoperiods in a changing climate (Stengl & Neupert groups); (4) Analysis of metal complexes and fragile polyphosphane scaffolds (Pietschnig group); (5) dynamic organisation of glycolytic pathways and the Calvin–Benson–Bassham (CBB) cycle during the switch from autotrophy (Gutekunst group); and (6) structure-function studies on recombinantly expressed human mutant proteins of the catalytic subunits of cAMP-dependent protein kinase (PKA) from multiple congenital malformation syndrome (Herberg group). Moreover, the novel molecular imaging platform will be integrated in various collaborative projects of our DFG-funded Research Training Group "Multiscale Clocks" (GRK 2749/1) and the recently approved EU-funded Marie Skłodowska-Curie Doctoral Programme (HORIZON – MSCA-DN).

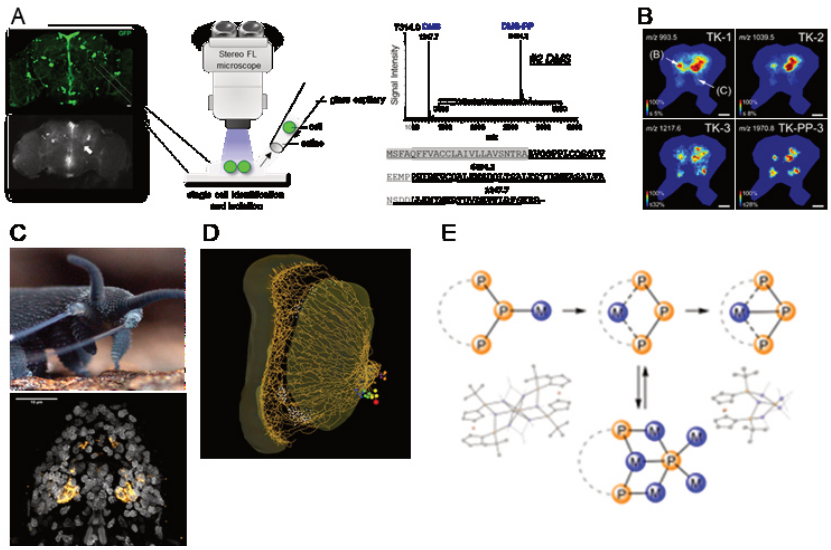

Fig. 1: Project portfolio. (A) Single cell mass spectrometry (Diesner et. al. 2007). (B) Ion maps of brain sections of the ant Cataglyphis nodus (Habenstein et al. 2021). Spatial distribution of the products of the tachykinin (tk) gene (section thickness: 14 µm), (C) Slime-ejecting specimen of the Australian onychophoran Euperipatoides rowelli (upper image; from Baer et al. 2014). Confocal image showing distribution of PDF neuropeptides in the brain of the tardigrade Hypsibius exemplaris (lower image; from Dutta et al. 2024). (D) Network of PDF-processing circadian pacemaker neurons in the optic lobes of the Madeira cockroach controls sleep-wake rhythms (Wei et al., 2010). (E) Reversible bond activation of stereochemically confined oligophosphanes (Franz et al. 2024).

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CINSaT Autumn Colloquium

Over 120 Participants at the Annual CINSaT Autumn Colloquium

On November 6, 2024, the annual autumn colloquium of CINSaT took place in Lecture Hall 282 at the Campus Heinrich-Plett-Straße of the University of Kassel. The event, featuring four distinguished speakers, three external and one internal, drew more than 120 registered. The colloquium is open to all those interested in scientific research related to nanoscience. Alongside the four lectures on timely and relevant topics, attendees had ample opportunity for scientific exchange during breaks and the poster session, where research from CINSaT members was showcased by enthusiastic postdocs and doctoral students.

The audience listens to the talks.

The colloquium began with a welcome address from Prof. Dr. Johann Peter Reithmaier, head of CINSaT, who introduced the first part of the lecture series. Prof. Dr. Ken Haenen of the University of Hasselt (Belgium) kicked off the event with a talk titled “From Nanocrystalline to Monocrystalline CVD Diamond Films – Doping Induced Properties,” which explored the versatile applications of diamonds in scientific research. This was followed by a presentation from Prof. Dr. Kees Weijer of the University of Dundee (UK), titled “Analysis of Critical Cell Behavior Driving Tissue Morphogenesis during Early Embryogenesis.” After a half-hour coffee break, which offered a chance for networking and a first look at the posters, the second part of the lecture series began. Prof. Dr. Rainer Adelung from the University of Kiel delivered the third talk, “Interdisciplinary Applications of Novel Porous Materials: From Actuators and Batteries to Cell Templates and Antiviral Agents.” The series concluded with a talk by Prof. Dr. Benoît Merle, a recent addition to the University of Kassel, titled “Nanoscale Insights into the Mechanical Behavior of Materials through Nanomechanics and In Situ Testing.” Prof. Merle’s presentation was part of his application process to become a full member of CINSaT.

Each talk generated lively discussions, which continued during the poster session that followed. The session featured 71 posters from CINSaT members’ research groups. The foyer in front of Lecture Hall 282 provided ample space for the posters and fostered productive exchanges of ideas on ongoing research. As always, the catering by Studierendenwerk Kassel kept attendees refreshed with a wide selection of food and beverages. The colloquium concluded with the presentation of poster prizes, awarded by this year’s jury—Prof. Dr. Jost Adam, apl. Prof. Dr. Thomas Fuhrmann-Lieker, PD Dr. Susanne Neupert, and Dr. Rico Huhnstock. The jury emphasized the high scientific quality of the posters, making their decisions difficult. The first prize, a €150 gift card, was awarded to Philipp Kästner (Technological Electronics, Prof. Dr. Hartmut Hillmer) for his poster “Ring-shaped MEMS Shutter Arrays for Interference Microscopy: Designs, Fabrication, Characterization.” The second prize (€100) went to Fabian Peterß (Laboratory Astrophysics, Prof. Dr. Thomas Giesen) for his poster “Cavity Enhanced Spectroscopy of Cold Plasmas.” The third prize

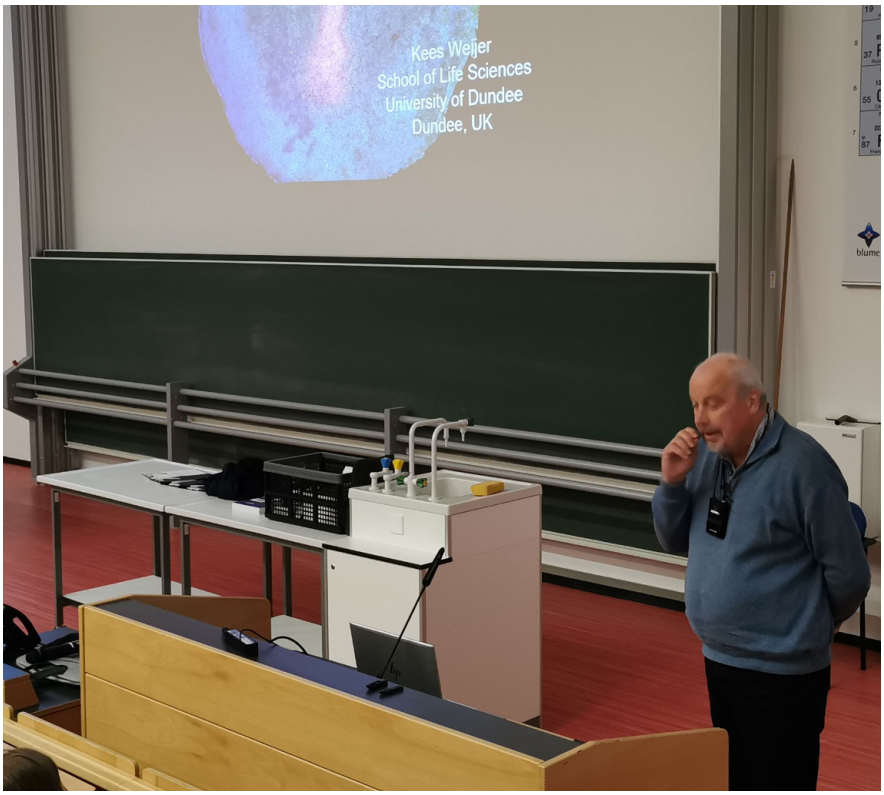
(€50) was awarded to Nico Kubetschek (Experimental Physics II, Prof. Dr. René Matzdorf) for his work on “Surface Catalyzed Synthesis of Benzofuran and Benzodifuran Molecules.”

Thanks to the high level of participation—both in terms of audience and poster contributions—and the balanced selection of lectures, the CINSaT Autumn Colloquium was a resounding success. We look forward to next year’s event.

Prof. Dr. Rainer Adelung (University Kiel).

Prof. Dr. Ken Haenen (University of Hasselt).

CINSaT-Applicant Prof. Dr. Benoit Merle.



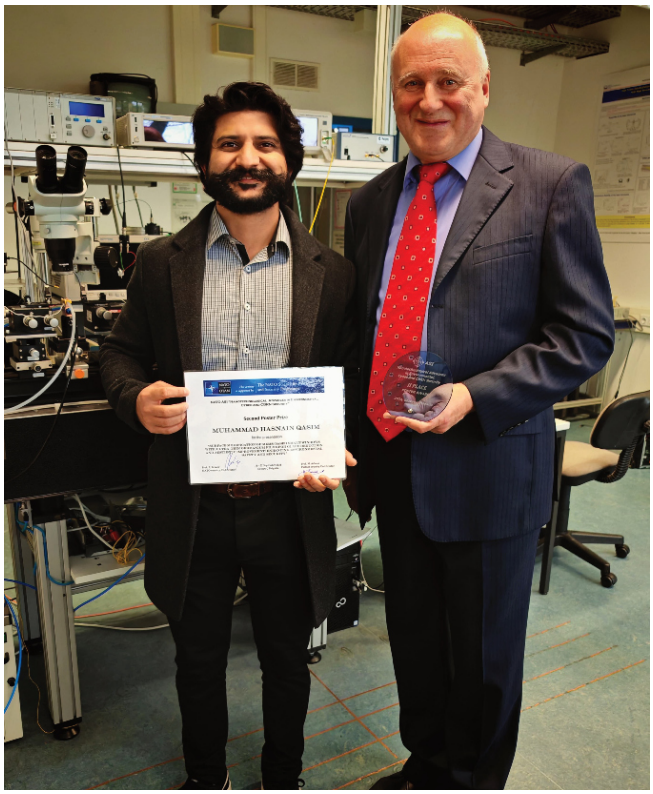
Prof. Dr. Kees Weijer (University of Dundee).

Winners and Jury members of the posterprize. Form left to right: Prof. Dr. Reithmaier (Speaker of CINSaT), Prof. Dr. Fuhrmann-Lieker (Jury member), Prof. Dr. Adam (Jury member), Nico Kubetschek (3rd Place), Philipp Kästner (1st Place), Fabian Peterß (2nd Place), Dr. Huhnstock (Jury member) and PD Dr. Neupert (Jury member).

Sozopol and OMN

Miriam Mendoza Delgado (Technological Physics) and Muhammad Hasnain Qasim (Technological Electronics), both from the Institute of Nanostructure Technologies and Analytics, CINSaT, were awarded poster prizes at the NATO Advanced Study Institute (ASI) on “Nanotechnological Advances in Environmental, Cyber and CBRN Security”. The five-member international jury evaluated the posters which were distributed in three poster sessions. Ms. Mendoza Delgado received the third prize for her poster “Technological steps for realization of diamond-based quantum tokens” in session “Fabrication, Characterization and Processing of Nanomaterials” and Mr. Qasim the second prize for his poster “Surface modification of MEMS-based smart windows with ultra-thin germanium films for glare reduction and aesthetic improvement: Enhancing environmental safety and security” in session “Nanoparticles, Nanocomposites, Glasses and Polymers”. The ASI took place between 14th and 22th September 2024 in Sozopol, Bulgaria and brought together about eighty participants from 15 NATO member and partner countries. It addressed the latest advances in Nanoscience and Nanotechnology in fields, such as, information technology and cyber defense, security and safety in biotechnology and energy management, early detection and protection against chemical, biological, radiological and nuclear agents, environmental security, etc.

Miriam Mendoza Delgado and Cyril Popov with the poster awards.



Muhammad Hasnain Qasim and Hartmut Hillmer with the poster awards.

Philipp Kästner (Technological Electronics, INA) won the prize for the best poster at the International Conference on Optical MEMS and Nanophotonics (OMN) which took place in San Sebastian, Spain from 28th July till 1st August 2024. Furthermore, Prof. Hillmer was honoured with the “Most Paper Award” for 25 years of participation in OMN and the highest number of contributions to the conference. In total, over 100 participants presented their latest research ranging from micro-optics over nano-bio-photonics to novel fabrication technologies including 3D printing, as either oral talk or poster. The latter was rated by a four-head international jury. Mr. Kästner received his price for the poster “Ring-shaped MEMS Shutter Arrays for Interference Microscopy: Designs, Fabrication, Characterization” discussing the use of optical MEMS as a novel concept for advanced aperture diaphragms or simply micro irises. Along with an extensive social program, the conference concluded with a visit of the impressive labs at the Nanoscience Research Center CIC nanoGUNE located in the heart of the Basque Country, San Sebastian.

Participants of OMN 2024 coming from University Kassel, from left to right: Xiaohui Yang, Thomas Kusserow, Roland Donatiello, Md Kamrul Hasan, Philipp Kästner, Basma Elsaka, Hartmut Hillmer, Guilin Xu, Jiahao Chen.

Announcements
CINSaT Alumni Database

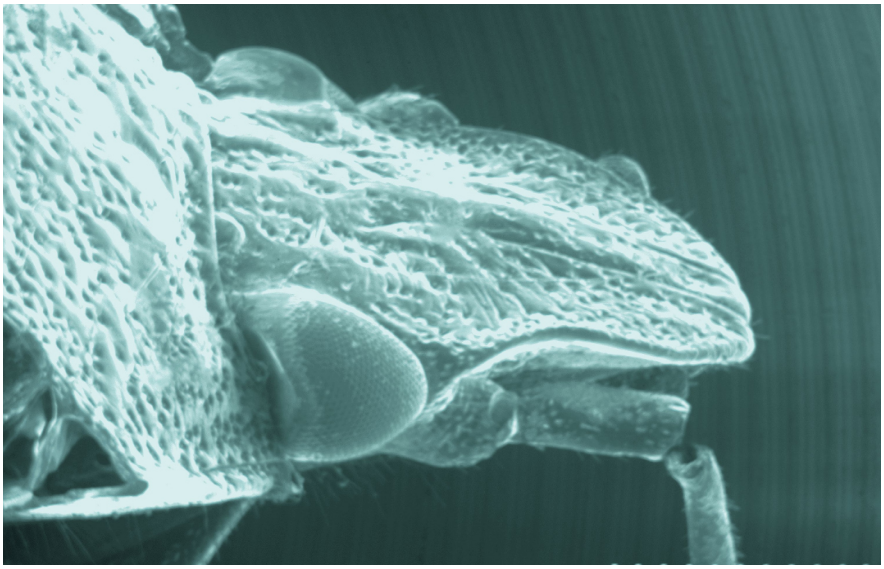
The CINSaT opens a database to stay in touch with former members of the CINSaT related research groups.

For over 20 years, young researchers from CINSaT groups have been working to achieve their diplomas or PhDs. In the last issue, we reported on the meeting of the first cohort of nanoscience students, and it became clear that the former students are now established members of the scientific community in academic or commercial research. This first impression needs to be quantified and we are happy to announce the start of the new alumni database. With this, former students and group members can enter their contact information to stay in touch with the CINSaT. Later on, a questionnaire will be send out to gather more information about the career path of our graduates.

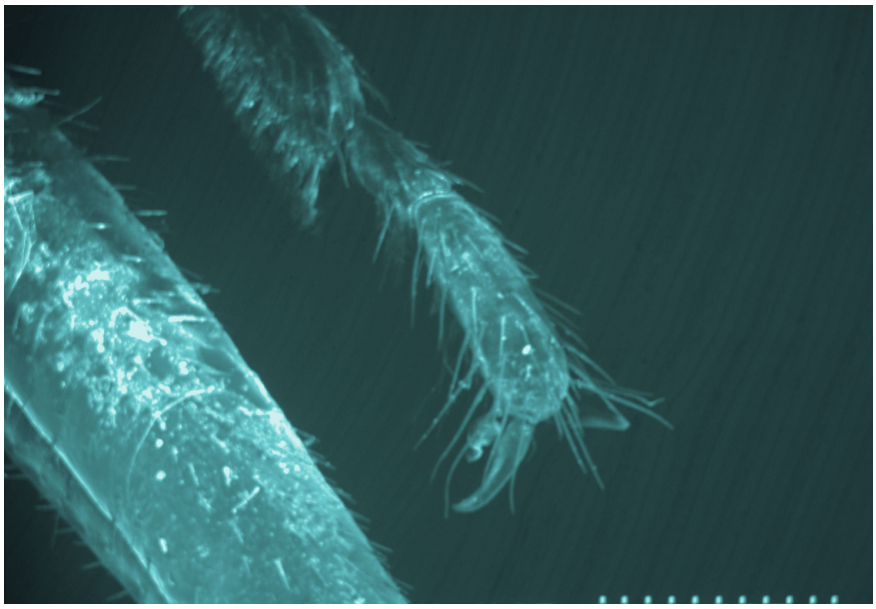
We therefore ask every member of the CINSaT or member of a CINSaT research group to forward this information to any known graduate from a CINSaT research group of the University of Kassel. Please share this information:

https://www.uni-kassel.de/forschung/cinsat/alumni

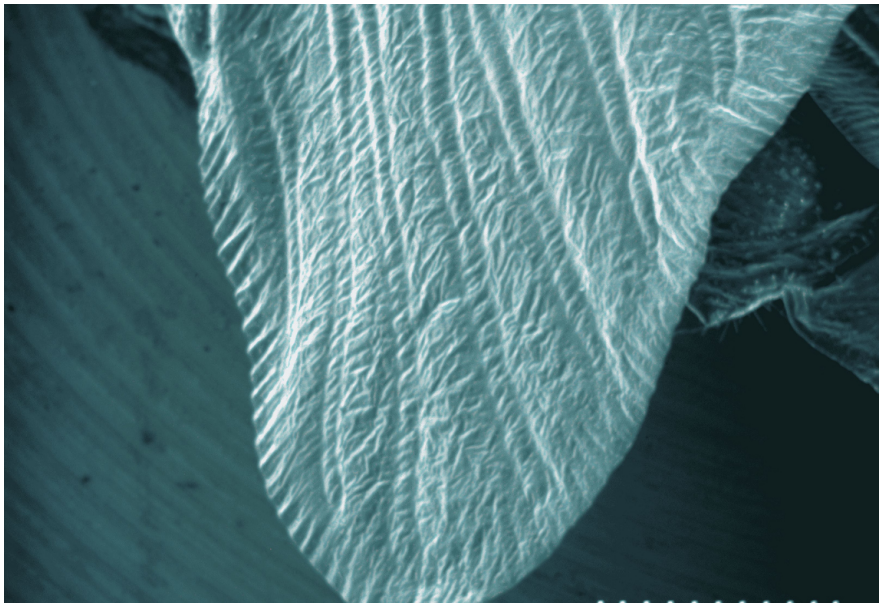
Nano Arts



SEM image of a Scutelleridae bug. The bug was dehydrated, glued to a holder with a conductive silver-based adhesive and coated with platinum. Preparation was done by Florian Schnabel (Technological Physics).



Leg of a Scutelleridae bug by Florian Schnabel.



Wing of a Scutelleridae bug by Florian Schnabel.

Photo: Campus Heinrich-Plett-Straße, Press and Public Relations Office University of Kassel, Studio Blåfield

Imprint

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