

First Inn Zwickau  
Feb 25 – 27, 2026



**ctd.qmat**  
Complexity, Topology and  
Dynamics in Quantum Matter

# CTD.QMAT

**QMA Retreat 2026**

Complexity, Topology and Dynamics  
in Quantum Matter



Julius-Maximilians-  
**UNIVERSITÄT  
WÜRZBURG**



Technische  
Universität  
Dresden

# Program overview

Wednesday 25 Feb 2026			Thursday 26 Feb 2026		Friday 27 Feb 2026																
12:00 Arrival			 <b>Breakfast</b>																		
			<b>09:00-10:20 Session 1</b>		<b>09:00 Invited talk</b>																
			09:00 Shuai Chen		<b>Dr. Giovanni Marini</b> Photoinduced phase transitions																
			09:20 Sabastian Granberg Cauchi																		
			09:40 Malte Bieringer																		
			10:00 Christine Barko																		
			 <b>Coffee break</b>		 <b>Coffee break</b>																
<b>10:35 Invited talk :</b>		<b>10:15-11:35 Session 3</b>																			
<b>Prof. Dr. Aparajita Singha</b> Nanoscale quantum sensing using NV centers		10:15 Maximilian Hofer																			
		10:35 Börge Mehlhorn																			
		10:55 Jakob Lindenthal																			
		11:15 Sander Scheel																			
 <b>Lunch</b>																					
<b>13:30 Welcome</b>			<b>13:10-13:40 QMA reps. announcement</b>		<b>13:00-14:00 Session 4</b>																
<b>14:00-16:30 Workshops</b>			<b>13:40-16:25 Social activity</b>		13:00 Bastian Pradenas																
			<b>Visit to the Horch Museum</b> <b>Topological Pottery</b>		13:20 Matteo Crispino																
					<b>13:40-14:00</b> Closing remarks + Best poster/talk award																
<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 33%;">Lisa Andergassen</td> <td style="width: 33%;">Matthias Vojta</td> <td style="width: 33%;">Chester Tan</td> </tr> <tr> <td>Applying for Industry Positions</td> <td>DFG Proposal Writing</td> <td>AI Applications in Science</td> </tr> <tr> <td></td> <td>15:00 – 16:00</td> <td></td> </tr> <tr> <td></td> <td>Free time</td> <td></td> </tr> <tr> <td colspan="3">16:00 – 16:30 Coffee Break</td> </tr> </table>			Lisa Andergassen	Matthias Vojta	Chester Tan	Applying for Industry Positions	DFG Proposal Writing	AI Applications in Science		15:00 – 16:00			Free time		16:00 – 16:30 Coffee Break			 <b>Coffee break</b>		<b>14:30</b> Departure	
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<b>17:00 Invited talk</b>			<b>16:40-18:00 Session 2</b>																		
<b>Dr. Ivan De Terlizzi</b> Phase Behavior of Cacio e Pepe Sauce: A Practical and Theoretical Guide			16:40 Gaopei Pan																		
			17:00 Carl Lehmann																		
			17:20 Samuel Seddon																		
			17:40 Moksh Bhateja																		
<b>18:00 – 19:30</b>  <b>Dinner</b>																					
<b>19:30 Poster session 1</b>			<b>19:30 Poster session 2</b>																		

# | Invited talks

Wednesday, Feb 25, 2026

17:00 – 18:00

Dr. Ivan De Terlizzi

## Phase Behavior of Cacio e Pepe Sauce: A Practical and Theoretical Guide

Pasta alla Cacio e Pepe is a beloved Italian classic, known for its simple yet iconic combination of pasta, pecorino cheese, and pepper. However, despite its minimal ingredient list, achieving the perfect creamy sauce remains a culinary challenge. In this talk, we delve into the science of Cacio e Pepe, exploring the phase behavior of the sauce with varying proportions of cheese, water, and starch. Our findings highlight starch concentration as a critical factor for sauce stability. Specifically, we identify a threshold below which starch concentrations (less than 1% relative to cheese mass) result in system-wide clumping, a condition we term the "Mozzarella Phase", characterized by an undesirable, separated texture. Additionally, we explore how cheese-to-water ratios at a fixed starch level affect stability, revealing a lower critical solution temperature that we rationalize using a simplified free-energy model. To make these insights actionable, we'll share some practical tips drawn from our study to help consistently achieve a perfectly creamy and stable sauce.

Thursday, Feb 26, 2026

10:35 – 11:35

Prof. Dr. Aparajita Singha

## Nanoscale quantum sensing using NV centers

Solid-state spin defects such as nitrogen-vacancy (NV) centers in diamond, have emerged as powerful platforms for quantum sensing, enabling nanoscale measurements of magnetic fields, temperature, strain, and electric fields at both cryogenic temperatures as well as at ambient conditions. My research group focusses on utilizing these quantum sensors for non-invasive probing of isolated magnetic molecules on surfaces, which are difficult to access using other complementary techniques. These efforts naturally require the usage of near surface NV centers ( $< 10$  nm) to gain desired magnetic sensitivity. However, such shallow NV sensors are also infamous for often lacking sufficient stability of their optical and spin properties. We take advantage of our UHV experimental conditions to understand the role of the diamond surface in defining these optical and spin properties for shallow NV sensors, as well as to better engineer the diamond surface with desired surfacechemistry. Another aspect of our current research involves two-dimensional mapping of both static and dynamic magnetization profile of synthetic antiferromagnets, as well as nanoscale devices, using scanning probe NV magnetometer. The key idea here is to identify their local nanoscale properties which are often obscured in conventional transport measurements. After introducing the essential concepts of nanoscale quantum sensing and providing a broad overview of the current research scopes in my experimental group, I will also highlight on the current challenges and the opportunities in this vibrant field of research.

Friday Feb 27, 2026

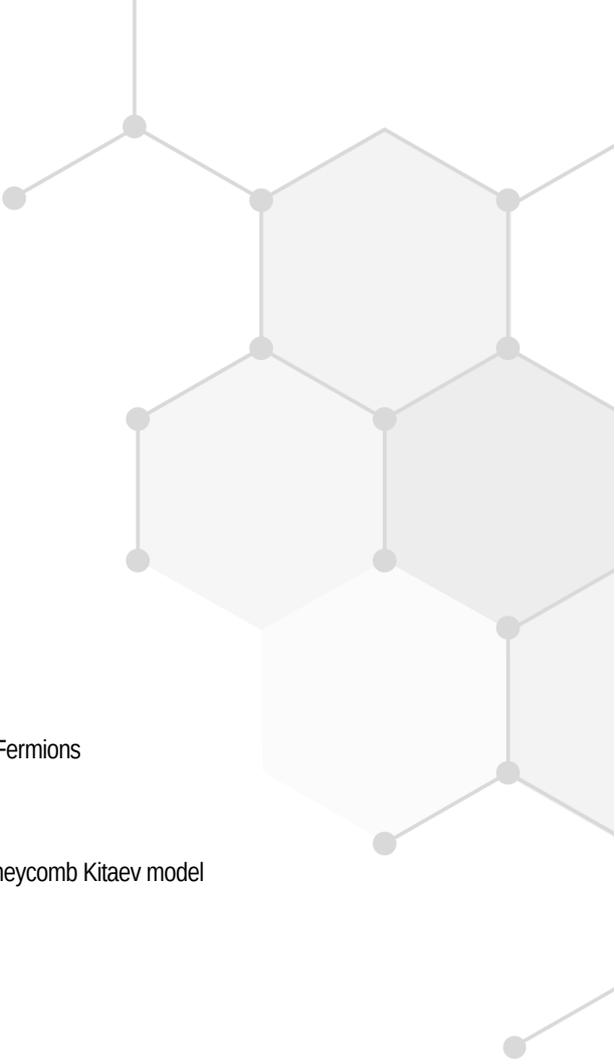
9:00 – 10:00

Dr. Giovanni Marini

### Photoinduced phase transitions

Ultrafast light pulses provide a unique and powerful handle to control quantum materials far from equilibrium, enabling access to phases and functionalities that are fundamentally inaccessible under thermal conditions. Acting on femtosecond timescales, photoexcitation can selectively perturb electronic, lattice, and spin degrees of freedom, rapidly reshaping the free-energy landscape to access metastable states or, in some cases, to drive the system into long-lived or even permanently altered phases. In this talk, I present a theoretical perspective on how ultrafast above-gap photoexcitation can be used to induce and control new phases in semiconductors. I discuss representative examples of light-driven transformations, spanning structural, magnetic, and topological phase transitions, and analyze the physical mechanisms that enable their emergence. Particular emphasis is placed on the relationship between photoinduced phase transitions and their thermodynamic equilibrium counterparts, highlighting both fundamental similarities and key differences that arise from non-equilibrium excitation pathways.

# List of contributed talks

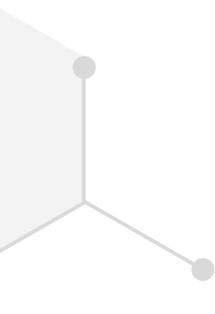


Thursday, Feb 26, 2026

## Session 1 9:00-10:20

- **9:00 Shuai Chen**  
Quantum Mechanics Forbids Particle Exchange Statistics beyond Bosons and Fermions
- **9:20 Sebastian Granberg Cauchi**  
Chiral spin liquid in external magnetic field: Phase diagram of the decorated-honeycomb Kitaev model
- **9:40 Malte Bieringer**  
Dynamical heterogeneity and fractal subdiffusive transport in spin-ice
- **10:00 Christine Barko**  
Topological edge states in the frequency dimension and their realization with Floquet electrical circuits

## Session 2 16:40-18:00

- **16:40 Gaopei Pan**  
Orbital-Selective Mott transition in a U(1) gauge model of the Kondo lattice: a Quantum Monte Carlo study
  - **17:00 Carl Lehmann**  
Probing Green's Function Zeros by Cotunneling through Mott Insulators
  - **17:20 Samuel Seddon**  
Twin wall functionality and tunability in ferroelastic LaAlO<sub>3</sub>
  - **17:40 Moksh Bhateja**  
Enhancing efficiency of local-information time evolution
- 

Friday, Feb 27, 2026

**Session 3**    **10:15-11:35**

- **10:15**    **Maximilian Hofer**  
Self-Consistent Electrostatic Modeling of Gated Narrow-Gap Topological Insulators
- **10:35**    **Börge Mehlhorn**  
Device fabrication with stencils
- **10:55**    **Jakob Lindenthal**  
All-optical diffraction-efficiency control of grating couplers in dielectric waveguides
- **11:15**    **Sander Scheel**  
Macroscopic monolayer WS<sub>2</sub> for robust room-temperature exciton-polaritons in open cavities

**Session 4**    **13:00-13:40**

- **13:00**    **Bastian Pradenas**  
Spontaneous symmetry breaking in the Heisenberg antiferromagnet on a triangular lattice
- **13:20**    **Matteo Crispino**  
Tunable Electronic Correlations in 135-Kagome Metals

# List of Posters

Odd-numbered posters will be presented on Wednesday, February 25,  
and even-numbered on Thursday, February 26.

No.	Name	Title
1	Victor Teodor Cozea	Topological Insulator Candidates
2	Jakob Wetzel	THz Near-Field Optical Responses of LaAlO <sub>3</sub> Ferroelastic Twin Domain-Walls and $\alpha$ -MoO <sub>3</sub> Twisted 2D Oxides
3	Yasmine Moumene	UHV station for nanofabrication of air-sensitive thin films
4	Thomas Kögel	Mottness from a black hole and a duality between Green's function poles and zeroes.
5	René Knispel	Upgrading an LT-STM with a qPlus-AFM system
6	Marcel Polák	Diode effect in microwave irradiated Josephson junctions with YSR states
7	Noah Endres	Realization of an acoustic Kagome lattice
8	Hannes Haberkamm	Growth and spectroscopy of altermagnetic MnTe
9	Daniel Zolfaghari	Quantum Entanglement in Time
10	Nico Albert	Quantum Mpemba effect from Stark localization
11	Helke Parussel	Superconductivity in altermagnetic band structures: mean-field and quantum Monte Carlo simulations
12	Vatsal Jain	TBA
13	Josef Willsher	Dynamics and stability of U(1) spin liquids beyond mean-field theory
14	Alena Lorenz	Quantics Tensor Trains (QTT) – Taming the Curse of Dimensionality
15	Francesco Servilio	Green's function zeroes in Antiferromagnets
16	Jonas Beck	Kekulé order from diffuse nesting near higher-order Van Hove points
17	Luis Walther	Persistence of the Berezinskii-Kosterlitz-Thouless transition with long-range couplings
18	Max Fischer	Kondo effect for hybridizations with flat bands coupled to phonons
19	Lorenz Löffler	Focused Ion beam (FIB) patterned Microcavities for Topological Lasers
20	Ujjval Mishra	Investigation of the magnetic structure of Erbium on W(110)

# | Workshops

**Wednesday, Feb 25, 2026 14:00-16:30**

## **Workshop 1: Applying for Industry Positions – CVs, Interviews & the German Job Market (Max. 15 Participants)**

**Presenter: Lisa Andergassen from KEPOS Career Development**

### **Description :**

This workshop provides participants with a practical introduction to applying for industry positions, with a strong focus on preparing effective CVs and successfully navigating job interview

## **Workshop 2: DFG Proposal Writing**

**Presenter: Prof. Dr. Matthias Vojta**

### **Description :**

Prof. Dr. Matthias Vojta will give a presentation on potential funding sources from the DFG (including postdoctoral and group-leader positions) as well as tip and tricks for writing successful funding proposals.

## **Workshop 3: AI Applications in Science**

**Presenter: Mr. Tan from CAIDAS (Center for Artificial Intelligence and Data Science)**

### **Description :**

This workshops covers the basics of deep learning and includes hands-on demos of AI models for physical simulations and the use of AI assistants. The workshop will also include best practices for citing AI for university and DFG applications.