Symposium Beyond Transistors: Material-Based Edge Computing Paradigms (SYBT)

jointly organised by
the Magnetism Division (MA) and
the Functional Materials Division (FM)

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The rapid progress of artificial intelligence has led to unprecedented computational capabilities, but also to growing energy and resource demands that challenge edge computing applications such as autonomous systems and smart sensors. These resource limitations are rooted in the conventional von Neumann architectures and silicon-based transistors of the current technology. This symposium explores alternative paradigms in which computation emerges directly from the intrinsic properties and dynamics of materials. Bringing together experts primarily from condensed matter physics and optics, the focus lies on material-based platforms, including spintronics, ferroelectrics, ionic and phase-change materials, as well as photonic and hybrid ligh-matter platforms. These systems enable complementary functionalities, including non-volatile, analog, and high-speed information processing, naturally supporting concepts such as neural networks and physical reservoir computing. By focusing on material-intrinsic physical effects for computing, the symposium aims to highlight conceptually new, energy-efficient pathways toward scalable edge AI beyond traditional transistor-based technologies.

Overview of Invited Talks and Sessions
(Lecture hall HSZ/AUDI

Invited Talks

SYBT 1.1	Wed	9:30–10:00	HSZ/AUDI	**Finding Neuromorphic Advantage with Magnetism** — •Johan Mentink
SYBT 1.2	Wed	10:00–10:30	HSZ/AUDI	**Accelerating Neural Networks Computation with Ferroelectric Oxides** — •Laura Bégon-Lours, Nikhil Garg, Alexandre Baigol, Anwesha Panda, Nathan Savoia, Alexander Flasby
SYBT 1.3	Wed	10:30–11:00	HSZ/AUDI	**a photonic approach to probabilistic computing** — •Wolfram Pernice
SYBT 1.4	Wed	11:15–11:45	HSZ/AUDI	**Tackling Reliability and Scalability in Neuromorphic Computing via Noise-aware Learning** — •Eleni Vasilaki
SYBT 1.5	Wed	11:45–12:15	HSZ/AUDI	**Bayesian nanodevices for trustworthy artificial intelligence** — •Damien Querlioz

Sessions

SYBT 1.1–1.5	Wed	9:30–12:15	HSZ/AUDI	**Beyond Transistors: Material-Based Edge Computing Paradigms**