FLAIR

# Colloquium

**SFB 1548 - Institute of Materials Science – TU Darmstadt**

## Thursday, 15.2.2024, 16:00

**L2|03, R5 (Kleiner Chemiehörsaal)**

**ZOOM Meeting ID: 667 0827 0586**

## NEUROMORPHIC COMPUTING – INGREDIENTS FOR A FUTURE AI HARDWARE


**Prof. Dr. Rainer Waser**
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In information technology, there is currently a transition from classical instruction-based computation, where algorithms are the recipes for data processing and lead to predictable results, to AI-based computation, which relies on machine learning and the automatic extraction of knowledge from data to produce results with a certain probability. The clear downside of this development is the enormous and increasing energy consumption of computing systems.

For this reason, I will motivate my talk with the climate change. In our projects, we are researching devices and systems for Neuromorphic Computing (NC) that are more energy-efficient than classical approaches. The focus of our research is on redox-based memristive elements. The word memristive reflects a combination of a memory and a resistor, so it is a resistor with (non-volatile) memory. It is generally believed that these elements represent a potential improvement beyond the limits of current memory technology in terms of write speed, write energy and scalability. In particular, they can provide an energy-efficient approach to NC concepts. However, it will be of big importance that energy saving is not counter-balanced by rebound effects.

In this talk, fundamental aspects of the physics of these elements will be briefly presented. The polarity of the memristive switching and the geometry will be discussed. Furthermore, the ultra-high non-linearity of the switching kinetics of redox-based memristive switching devices will be outlined with a focus on the two types of bipolar switching systems. In the outlook, we consider the implications of memristive-based NC and its potential impact on future AI. This will lead to aspects of benefits and threats by AI on a personal and societal level.


**Interessierte sind herzlich eingeladen !**


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