Welcome

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FIAS Frankfurt Institute for Advanced Studies

Frankfurt Institute of Advanced Studies (FIAS)

- Founded in 2004 by W Greiner and W Singer with the support of the president R Steinberg as a private foundation that closely collaborates with the Goethe University in Frankfurt
  - Theoretical and phenomenological studies (experimental data from external sources)
  - Today focus on
    - Natural science (heavy ion collisions, gravitation, …)
    - Neuroscience and life science (vision, neurons, cell membrane, molecular transport)
    - Computer science and AI (HPC, quantum, seismology, energy distribution, energy efficiency, …)

Complex systems

digital twins

What do the human brain, biological networks, developing organisms, the immune system, flocking birds, AI systems and quantum devices have in common?

All these systems, while vastly different in their appearances, spatial and temporal scales and functions, unfold their dynamics in high-dimensional state spaces. At the same time, external stimuli can condense these complex spaces onto a dramatically smaller subset of states that represent targeted responses to these inputs. Most intriguingly, this subspace may emerge from low-order, often linear interactions and superpositions, which appear to balance the potential of generating arbitrary solutions against processes that filter out apt solutions from all physically possible ones. Ultimately, this enables the emergence of new and meaningful system states seemingly out of nothing.

Is this the basis of knowledge, cognition, and information processing in general? And if so, can we identify common principles and relevant differences by comparing such systems across different realms and disciplines? This conference will bring together experts from **neuroscience, physics, molecular and developmental biology, simulation and machine learning, and quantum computing and sensing**. It will explore fundamental commonalities across systems from these distinct fields, at the same time highlighting their peculiarities, and how material and temporal constraints may have shaped them.

Goal of the Conference

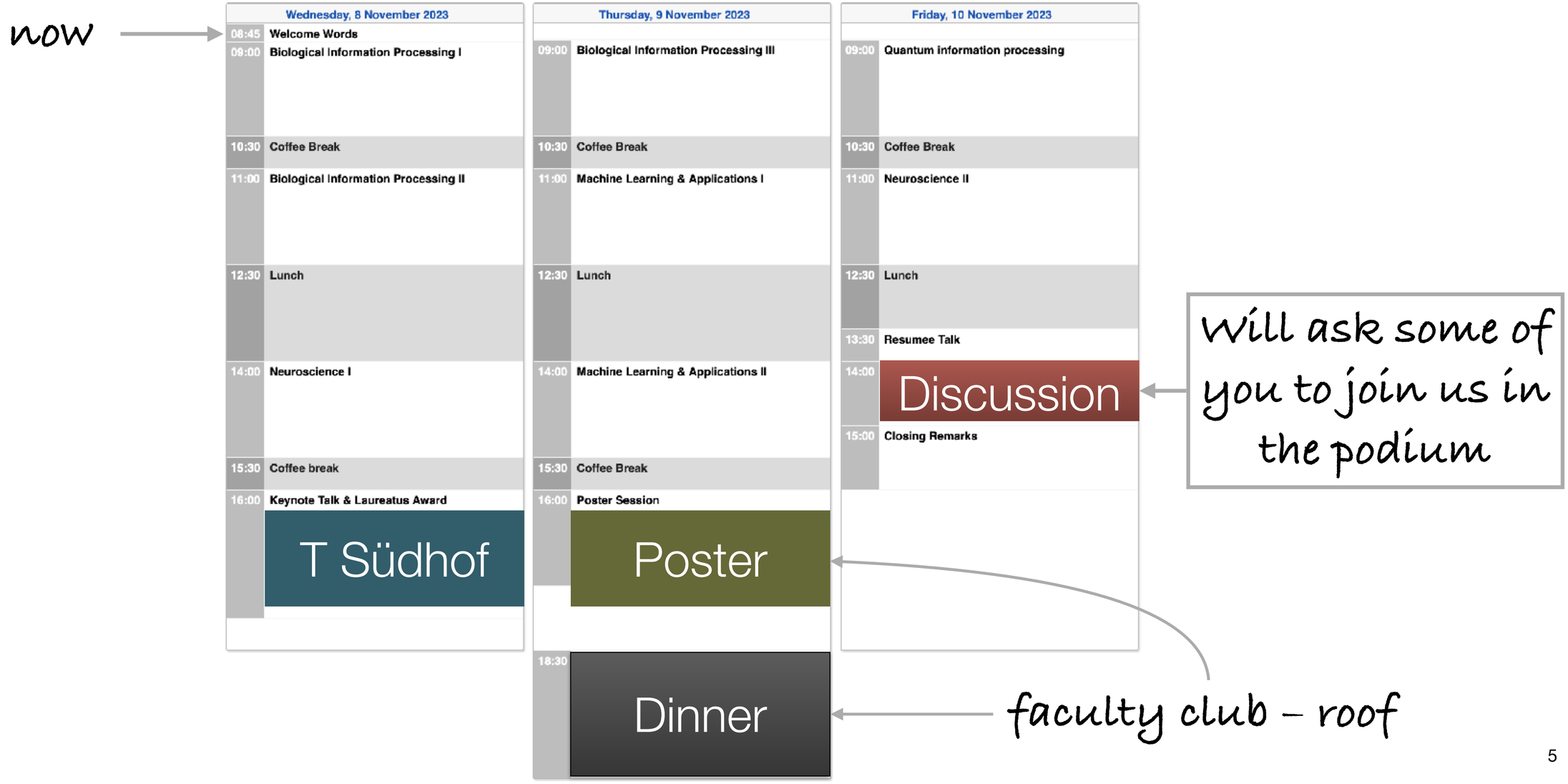
- Experts from **neuroscience, physics, molecular and developmental biology, simulation and machine learning,** and **quantum computing and sensing** have been invited

- **Explore** fundamental **commonalities** across systems from these distinct fields, at the same time highlighting their peculiarities, and how material and temporal constraints may have shaped them

- *Basis of **knowledge, cognition, and information processing** in general**?***

- At the end of the conference we will hold a podium discussion session where some of you will be invited to share their thoughts

Structure of the Conference



Presentations

- We had hoped to hold an in-presence conference only
  - not possible – in part also because of the political situation
- Hybrid conference imposes constraints on method of presentation
  - much much preferred to use presenter laptop
    - please upload your talk to indico
    - if not you have to start a zoom session and share your presentation
  - audio „sensitive“ in remote connections (3s leading mute period)

Organisation

- Lunch
  - a list of restaurants has been provided (separate flyer)
- WLAN
  - please use **eduroam**

Welcome and Enjoy!