



EBRAINS

Success Story

Invited speaker & AMA Panellist

Ekaterina Zossimova

Forschungszentrum Jülich, Germany



Outline

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- Building a career in **research**

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- Brain science and computing

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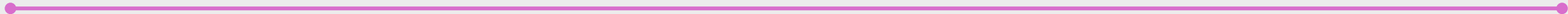
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- Brain science and computing
- Science support and **co-design**
- Tips for current PhD students

Building a career in research

FROM **PHYSICS** TO **SUPERCOMPUTERS**

Timeline

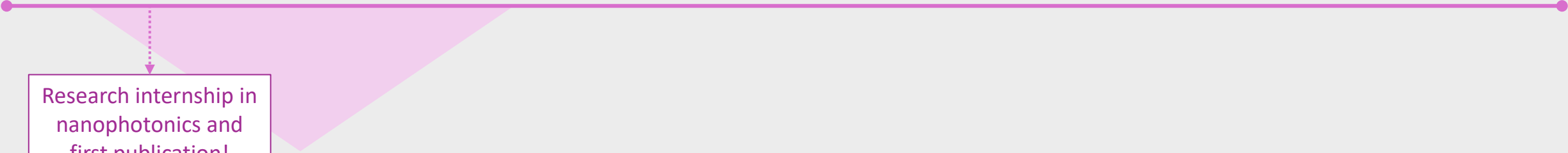


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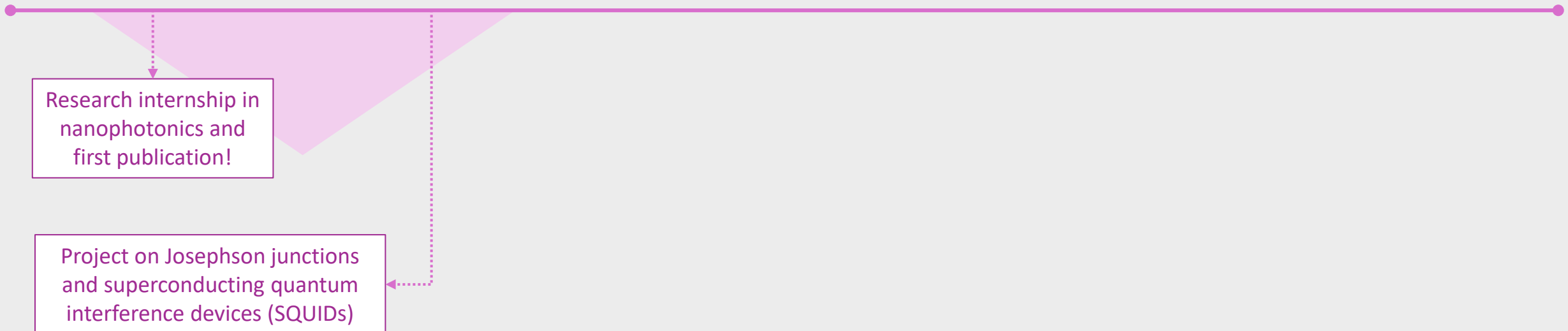
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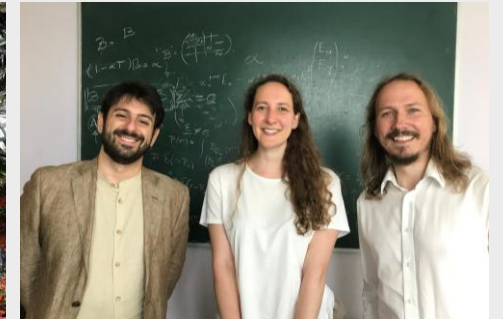
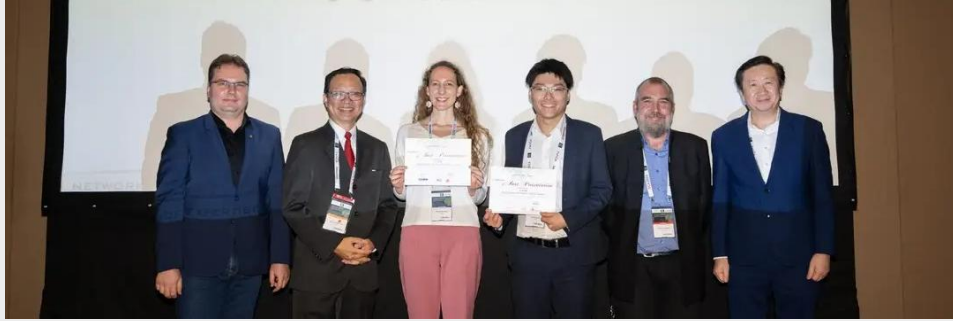
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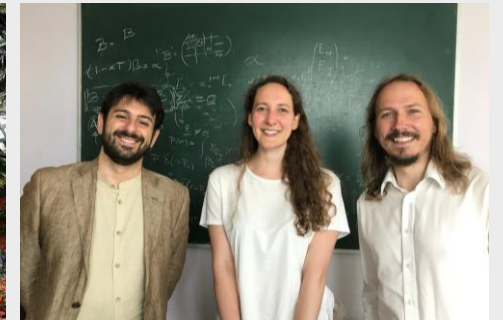
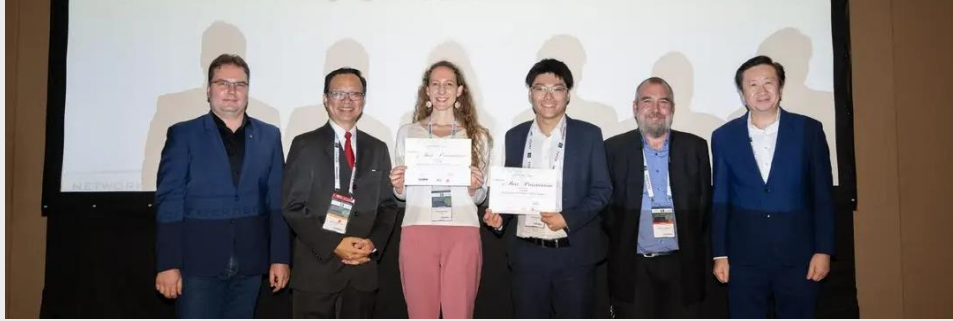
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EBRAINS Summit and PhD Networking Event!

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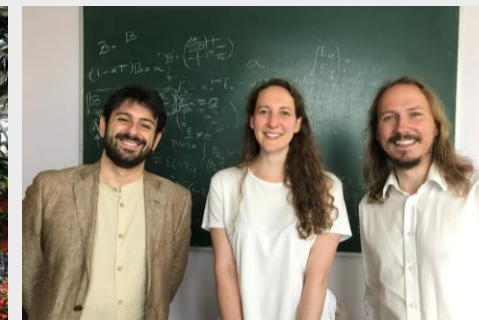




The famous whispering gallery modes in St Paul's Cathedral (London, UK), are analogous to the **optical whispering gallery mode** resonances observed in **glass microspheres**

Awards ceremony for the **APAC HPC-AI Competition** in Singapore

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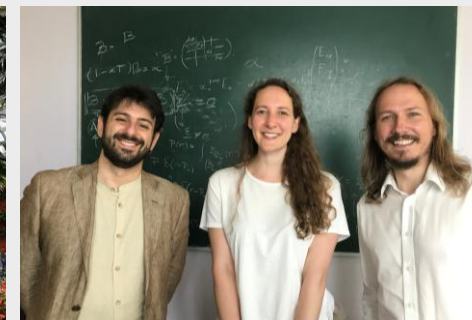


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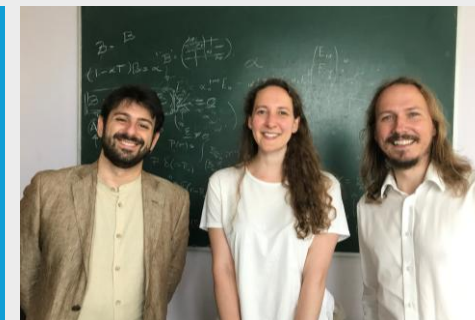
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Picture with my examiners!



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- Access to HPC infrastructure and training resources

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- International **friendships**

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What's next?

Brain science and computing

RESEARCH TOPICS AT **FORSCHUNGSZENTRUM JÜLICH**

Overview

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- High Performance Computing (**HPC**) for brain research

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- Artificial Intelligence (**AI**) for Virtual Brain Twins

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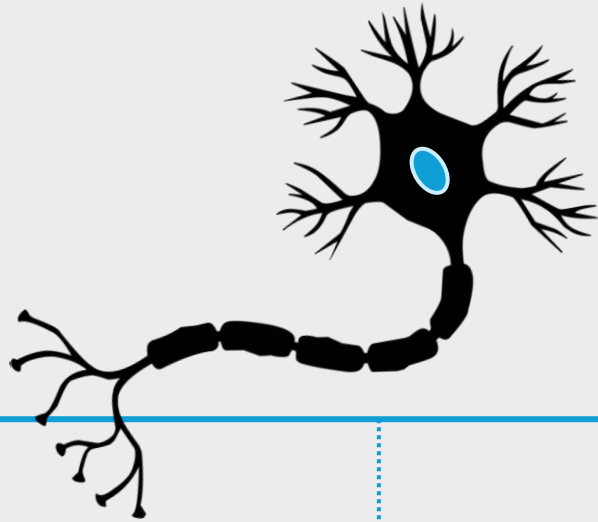
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- High Performance Computing (**HPC**) for brain research
- Artificial Intelligence (**AI**) for Virtual Brain Twins
- Development of infrastructure for open brain research
- Neuromorphic and **brain-inspired** computing

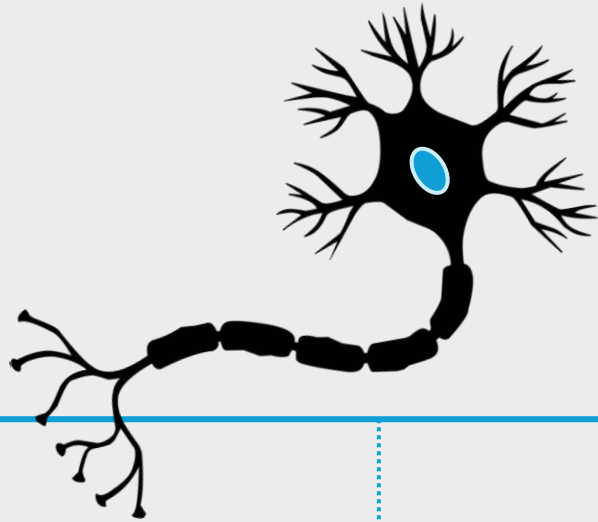
The multi-scale brain

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Simulate networks of multi-compartment, morphologically detailed neurons with **Arbor**.

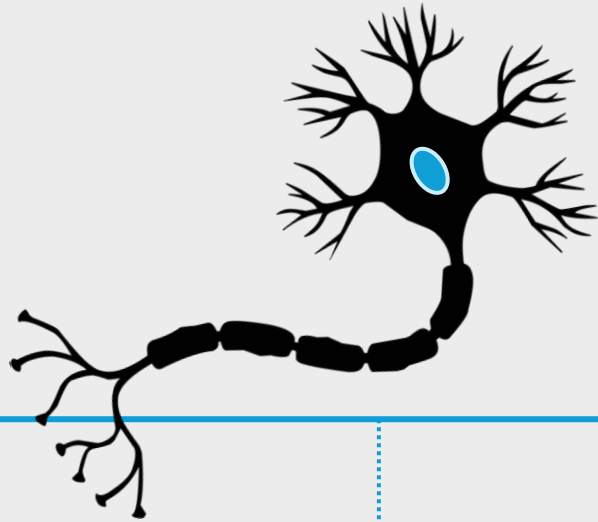
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Simulate networks of point neurons, or few-compartment neurons with **NEST**.

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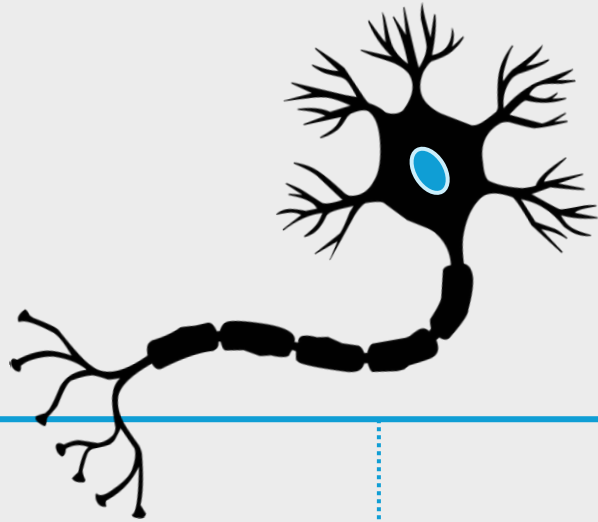
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Will we ever fully understand how the brain works?

High Performance Computing



High Performance Computing

JUPITER

- First European **exa-scale supercomputer**
- 4th fastest in the world (as of Nov 2025)
- Architecture:
 - 24,000 NVIDIA GH200 **Grace Hopper** Superchips
 - NVIDIA Quantum-2 **InfiniBand** networking platform



High Performance Computing

What are the challenges?


- Make **old code** compatible with new hardware
- Brain simulation are typically **memory-bound**; e.g. due to large connectivity matrices
- Model **resolution**; trade-off between speed and precision
- Numerical precision issues will be magnified



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**We need enthusiastic
early career researchers
to take on these
challenges!**

Quiz question #1

The number of transistors on an NVIDIA GH200 Grace Hopper Superchip is comparable to...

- A. the number of neurons in the mouse cerebral cortex (~14 million)*
- B. the number of neurons in the human cerebral cortex (~16 billion)*
- C. the number of neurons in the human brain (~86 billion)*
- D. the number of stars in our galaxy (> 100 billion)*

Science support and co-design

CONTINUOUS DEVELOPMENT AND DRIVING **NEW INITIATIVES**

Science Support in **EBRAINS**

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- Formalize technical and scientific workflows

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- Formalize technical and scientific workflows
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- Initiate **collaborations**

Co-Design



Co-Design

Assess project **needs & requirements:**

- Data storage
- Cloud and HPC resources



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Engage with different **experts:**

- Ethics
- Education
- Communications

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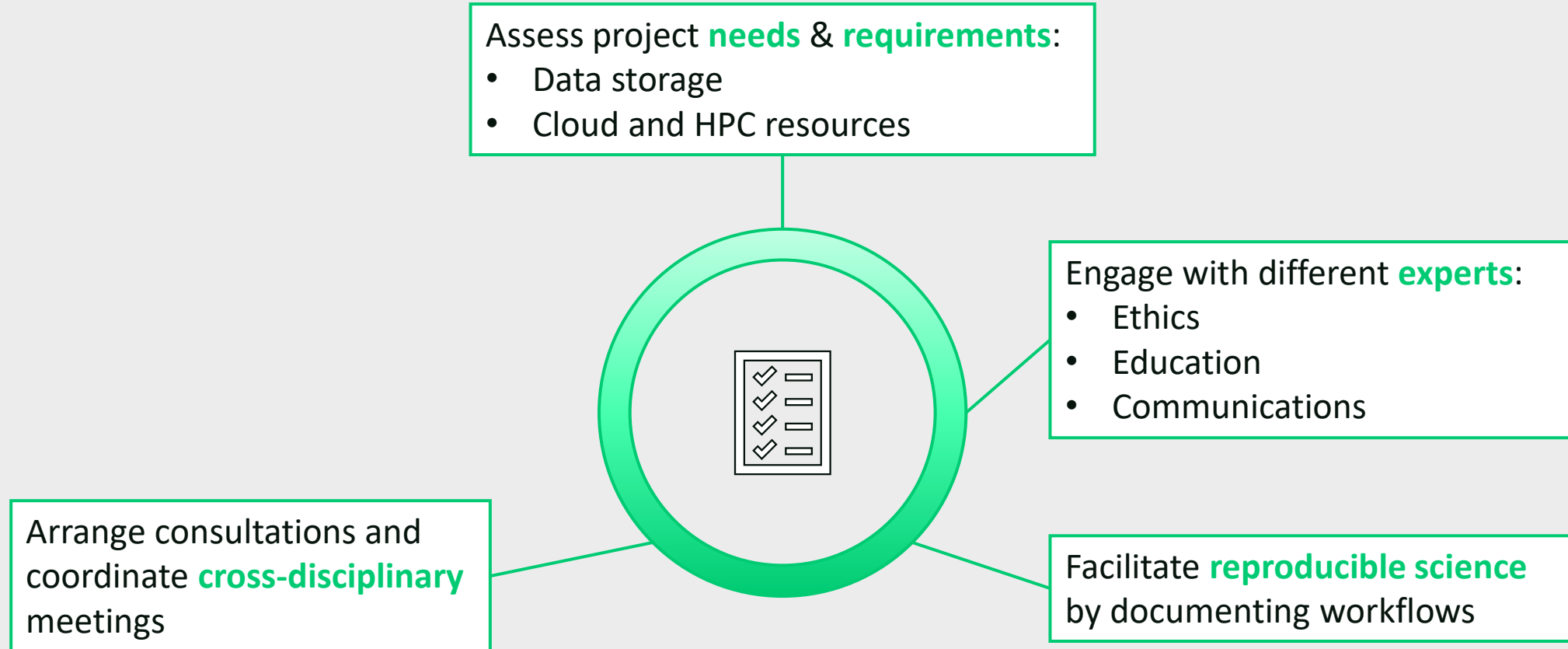


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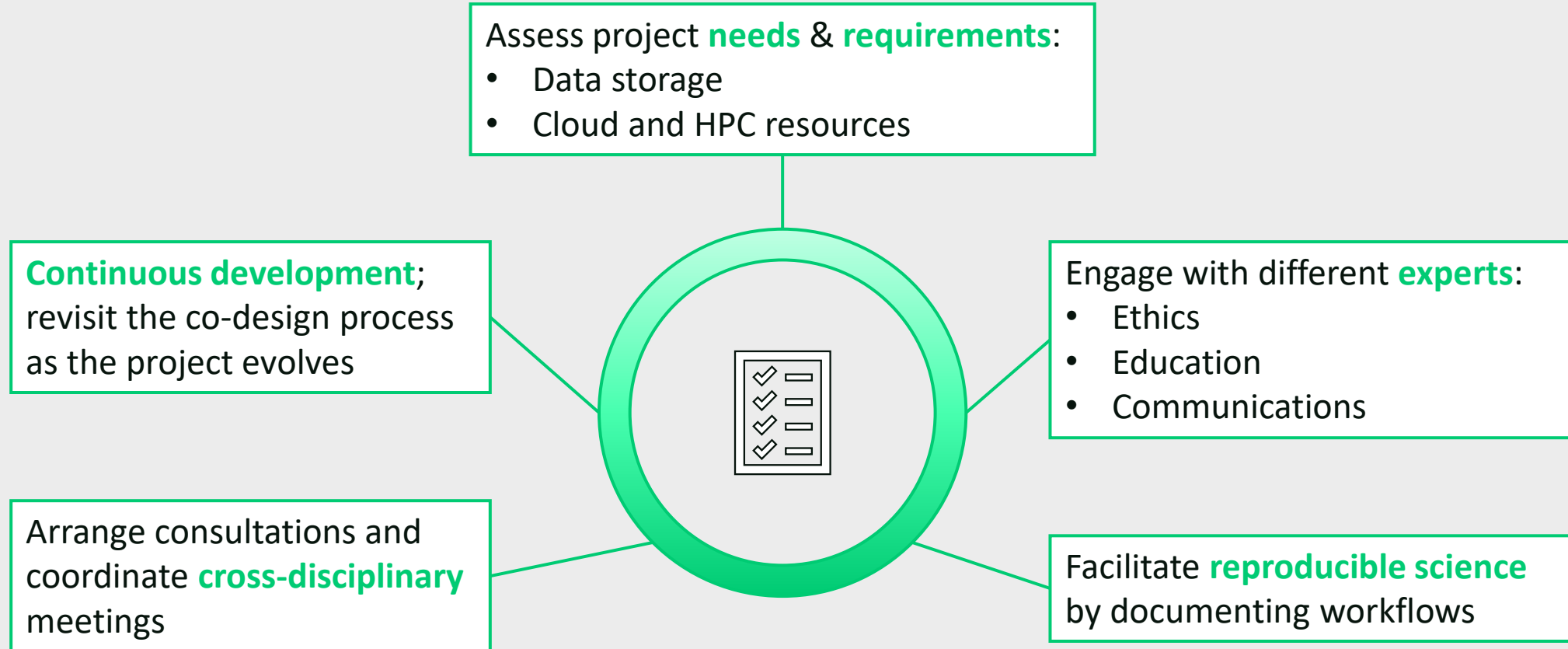
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Facilitate **reproducible science**
by documenting workflows

Co-Design



Co-Design



Quiz question #2

How many bytes of data are generated by an Electron Microscopy reconstruction of 1mm^3 of the human temporal cortex?

- A. 1.4 Terrabytes (10^{12})
- B. 1.4 Petabytes (10^{15})
- C. 1.4 Exabytes (10^{18})
- D. 1.4 Yottabytes (10^{24})

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Source: Shapson-Coe, A., *et al.* (2024). A petavoxel fragment of human cerebral cortex reconstructed at nanoscale resolution. In *Science* (Vol. 384, Issue 6696). American Association for the Advancement of Science (AAAS).
<https://doi.org/10.1126/science.adk4858>

Tips for current PhD students

EVERY JOURNEY IS **UNIQUE**

Get to know your research community

- Join a society or organization as a **student member** (e.g. The Bernstein Network; INCF)
- **Volunteer** for events
- Look out for summer schools; travel grants; and **international exchange** programmes
- Know where to find opportunities and training events (e.g. newsletters; journals; university career centre)

Personal effectiveness

- Find a daily routine that works for you
- Be open to **new ideas** and allocate time to read papers
- Learn how to communicate your research to different groups
- Build **resilience** and learn how to navigate conflict with supervisors
- Look after your **health** and **wellbeing**

Defend your thesis

- Start writing **early** and **often**
- Stay up to date with the most recent literature
- Remember that **you are the expert** on your thesis topic!

What's next?

- Take a moment to celebrate and **reflect** on your experience
- Nurture your networks
- Highlight **transferable skills**
- Consider personal circumstances

Uncertainty is the only certainty there is, and knowing how to live with insecurity is the only security.

Prof. John Allen Paulos



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