FROM NEURONS TO NETWORKS: *WHOLE BRAIN EMULATION*

FORESIGHT INSTITUTE

a non-profit advancing frontier biotech, neurotech, nanotech, AI, & spacetech.

FORESIGHT INSTITUTE

OUR APPROACH

1

INVESTING IN UNDERFUNDED TALENT

Grants
Fellowships
Prizes

2

FIELD-BUILDING & INCUBATION OF NEW VENTURES

Workshops
Vision Weekends
Seminars

3

MAPPING HIGH IMPACT PATHS FOR PROGRESS

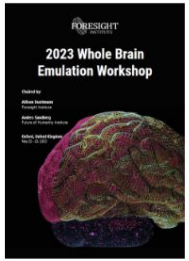
Tech Trees
Technical Reports
Existential Hope Worldbuilding

We expect that the first WBE project will have internal dynamics and behavioral outputs that are almost identical to the original system. Error margins will account for the chaotic nature of the brain which make the emulation and original slightly diverge after time if the initial conditions differ. In short, a WBE that is practically functionally and behaviorally indistinguishable from the evolution of the original system.

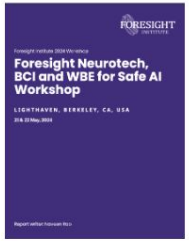
The pursuit of Whole Brain Emulation (WBE) is valuable for several reasons:

- It may yield critical near-term insights for neuroscience and medicine.
- It could facilitate digital longevity, cognitive enhancement, and space exploration.
- It may help answer fundamental questions about sentience and human nature.
- **Decreasing AGI/ASI Risk.** WBE could provide insights into creating artificial intelligences and might serve as a bridge between humans and AGI/ASI. WBE could enable a different path, where AI improvements enhance digital humans instead of generating separate adversarial entities.

WORKSHOPS



[2023 Oxford WBE Workshop]: Chaired by Anders Sandberg, this event focused on AGI timelines, the acceleration of WBE technologies, and the potential of aligning these technologies with AI development.



[2024 Berkeley WBE Workshop]: Sixty researchers, entrepreneurs, and funders gathered to explore advances in neurotechnology with respect to AI safety, focusing on coordinated efforts to accelerate progress and mitigate risks.

1.5 MILLION REGRANTED BY FORESIGHT INSTITUTE'S AI SAFETY GRANTS

AI Safety Grant - Neurotech Grantees include

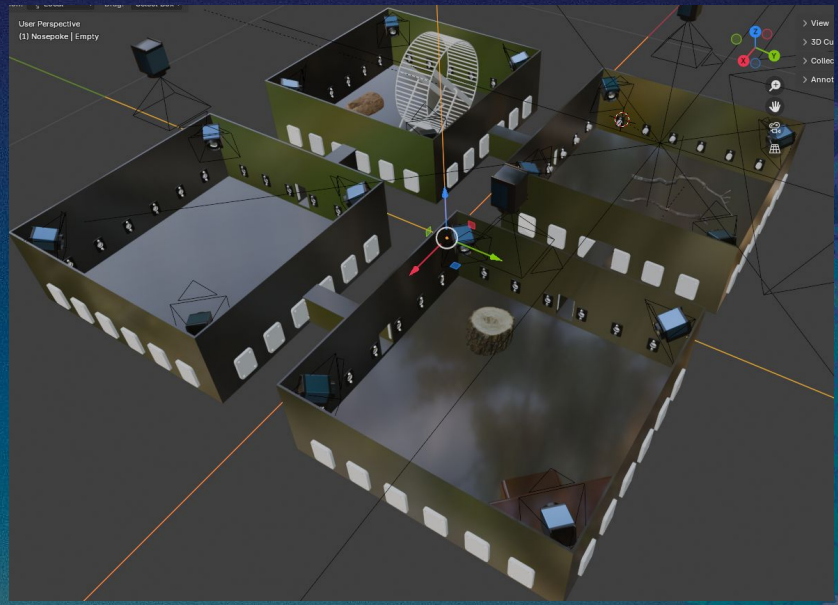
Ed Boyden, MIT, **Konrad Kording, University of Pennsylvania**
To simulate a first complete brain in C. elegans

Marc Carauleanu, AE Studio
Self-Other Overlap via Fine-Tuning

Catalin Mitelut, Netholabs
Functional (lofi) whole-brain-emulation in the mouse

Roman Bauer, University of Surrey
Computational Modeling of Neural Development

"This grant significantly accelerated my progress. It spurred me to share the project more broadly, create a working codebase and demos, and to build scalable training infrastructure." – *Grantee*



[Catalin Mitelut: Netholabs]
Functional (lofi) whole-brain-emulation in the mouse

Case studies: A little $upport goes a long way

The Feynman Prizes have a knack for spotting future Nobel laureates. Just ask Sir Fraser Stoddart (2007 Feynman Prize Winner, 2016 Nobel Prize Winner) or David Baker (2004 Feynman Prize Winner, 2024 Nobel Prize Winner).

Supported by Foresight's AI Safety Grants, Catalin Mitelut, recently founded his new company Netholabs. His work on "Lo-fi approaches for uploading" is pushing the boundaries of our current understanding of biological organisms and artificial intelligence.

During Foresight's 2021 Biotech Workshop, Foresight Fellow, Jean Hebert, proposed tissue replacement of aging brain cells as an alternative longevity paradigm – to our knowledge the first proposal of this kind. The groundbreaking approach captured the attention of prominent investors and the concept emerged as a cornerstone in the field. Both the Amaranth Foundation's 2024 Longevity Bottleneck Assessment and the Longevity Biotech Fellowship's strategic roadmap note his work.

Foresight Fellow Patrick Mellor hosted a Foresight Seminar genetically modifying trees to increase carbon sequestration and met his co-founder Maddie Hall and founded Living Carbon, which was accepted into YCombinator and has raised $30M since. In addition, Patrick's presentation prompted a DOE program manager who was present at the event to launch a new DOE program to support R&D in this domain.

With support from Foresight Institute's AI Safety Grant, this year, Andrew Trask from OpenMined developed a technical infrastructure to facilitate multilateral AI safety Evaluations R&D, which are now piloted in Europe to ensure that AI systems can operate securely in the real world. This work is now being scaled to be adopted broadly across the world.

Ideas explored at a Foresight Molecular Machines workshop, led Christian Schafmeister, Temple University to nine years of DoD support, with $5M in funding for novel catalysts development, followed by $12M in seed funding for ThirdLaw Molecular LLC and an additional $5M contract in 2022.

Our Neurotechnology Fellows are pushing the boundaries of brain-computer interfaces (BCIs) and whole brain emulations (WBEs).

Alumni Neurotech Fellows include

Michael Skuhersky
MIT

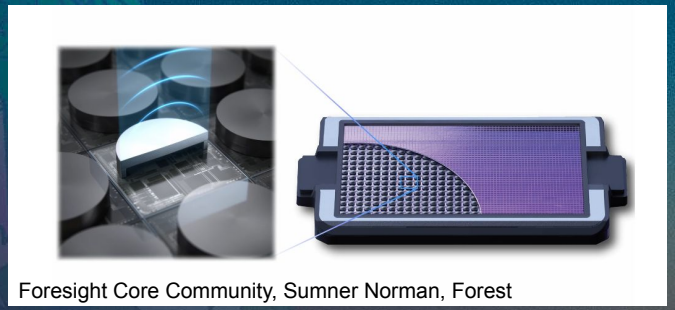
Sabrina Singh
Forest Neurotech

Andrew Payne
E11 Bio

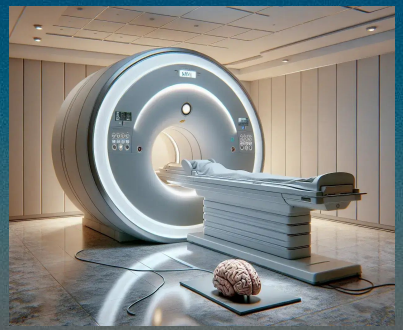
Claire Short
Athena

Niccolo Zanichelli
ML & Neuro engineer

Foresight Fellow, Akash Kullgod



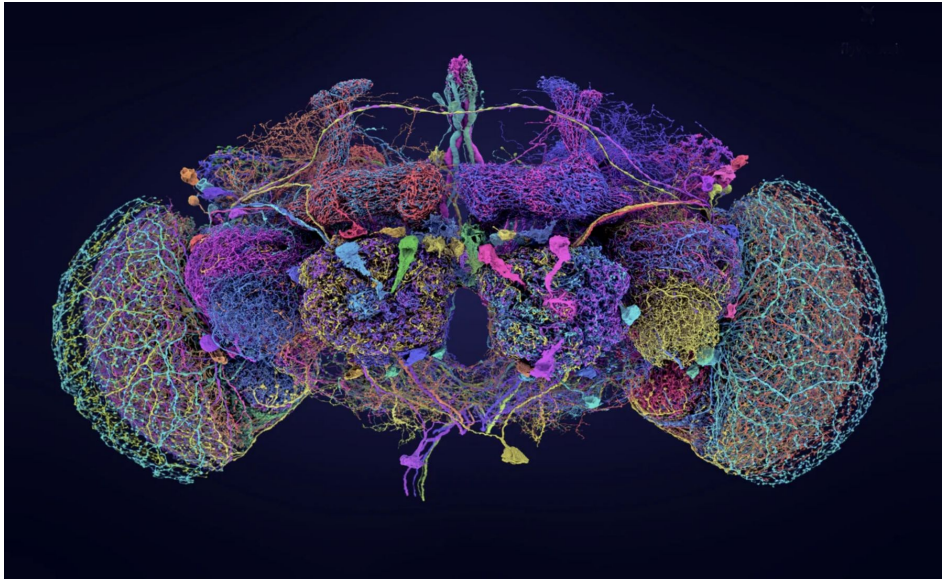
Foresight Core Community, Sumner Norman, Forest



Foresight Fellow, Claire Short

Enabling technologies

- In addition to the falling costs of compute, and new neuro-inspired hardware paradigms which might further benefit WBE progress, there is neuroscience progress such as:



- MiCRONS: Electron microscopy reconstructions of cortical circuitry from mouse visual cortex, with corresponding functional imaging data - open source project
- Largest Brain Map Ever Reveals Fruit Fly's Neurons in Exquisite Detail - announcement
- The time is ripe to reverse engineer an entire nervous system: simulating behavior from neural interactions - paper by Gal Haspel et al
- Large-scale high-density brain-wide neural recording in nonhuman primates - paper by Eric Trautman et al
- AI by Mimicking Human Intelligence - article by Patrick Mineault
- Required Innovations in Neurotech for Safe AI - talk by Juan Benet
- Lo-fi Approaches for Uploading - talk by Catalin Mitelut
- Forest Neurotech: An FRO using ultrasound for whole-brain recording - company
- OpenWater: A company using infrared light for neuro-imaging - company

Launching in 2025: Lo-Fi Whole Brain Emulation Mouse Brain Prize

OPPORTUNITY:
Whole Brain Emulation
Fast Grants & Prize

GOALS OF THE PROGRAM

Greatly accelerate Whole Brain Emulation (WBE) development with funding in the form of:

- **Fast Grants:** a fast-acting $10-$300K grant program (per project)
- **Grand Prize:** $20M will be awarded to the project that completes the first WBE of a human.

Grand Prize WBE definition:

- The grand prize will be awarded to the first WBE project whose internal dynamics and behavioral outputs are almost identical to the original system. Error margins will account for the chaotic nature of the brain which make the emulation and original slightly diverge after time if the initial conditions differ. In short, a WBE that is practically functionally and behaviorally indistinguishable from the evolution of the original system. Exact benchmarks and error margins will be determined by the judges. (Note: Structuring this prize itself will enable a process to converge differing opinions in the field and arrive at tangible definitions of WBE success.)

SO, JOIN US IN BUILDING THE FUTURE?

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