THE GENEVA SCIENCE AND DIPLOMACY ANTICIPATOR

USE THE FUTURE TO BUILD THE PRESENT

Martin Müller | Executive Director Science Anticipator | Geneva Science and Diplomacy Anticipator

WHY ANTICIPATE?

> It seems an odd thing to me that though we have thousands and thousands of professors and hundreds of thousands of students of history working upon the records of the past, there is not a single person anywhere who makes a whole-time job of estimating the future consequences of new inventions and new devices… But why shouldn't there be? All these new things, these new inventions and new powers, come crowding along; every one is fraught with consequences, and yet it is only after something has hit us hard that we set about dealing with it.
>
> .
>
> HG WELLS, BBC RADIO BROADCAST, 1932

UNSERE PRINZIPIEN

"Jeder hat das Recht, sich frei an der kulturellen Lebensweise der Gemeinschaft zu beteiligen, die Künste zu genießen und **an dem wissenschaftlichen Fortschritt und seinen Nutzen zu teilnehmen.**"

ART. 27 UN ALGEMEINE ERKLÄRUNG DER MENSCHENRECHTE

Im Sinne einer **ehrlichen Vermittlung** sollte die Antizipation der Wissenschaft so wenig wie möglich normativ sein, um **den Raum der Möglichkeiten und Handlungen in der Gegenwart zu erweitern** und die inhärenten Unsicherheiten der Zukunft zu berücksichtigen.

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GESDA - FROM THINK TANK TO DO TANK

GESDA ist ein öffentlich-privates Instrument der **Antizipation** und des **Handelns**, das ...

- künftige Entwicklungen in Wissenschaft und Technologie ANTIZIPIERT
- den Dialog zwischen Wissenschaft, Diplomatie, Industrie und Gesellschaft BESCHLEUNIGT, um gemeinsame Lösungsen zu globalen Herausforderungen zu entwickeln
- diese Lösungen konkret UMSETZT, indem es Initiativen und Projekte mit globaler Wirkung durch innovative Partnerschaften.

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GESDA'S METHODOLOGIE

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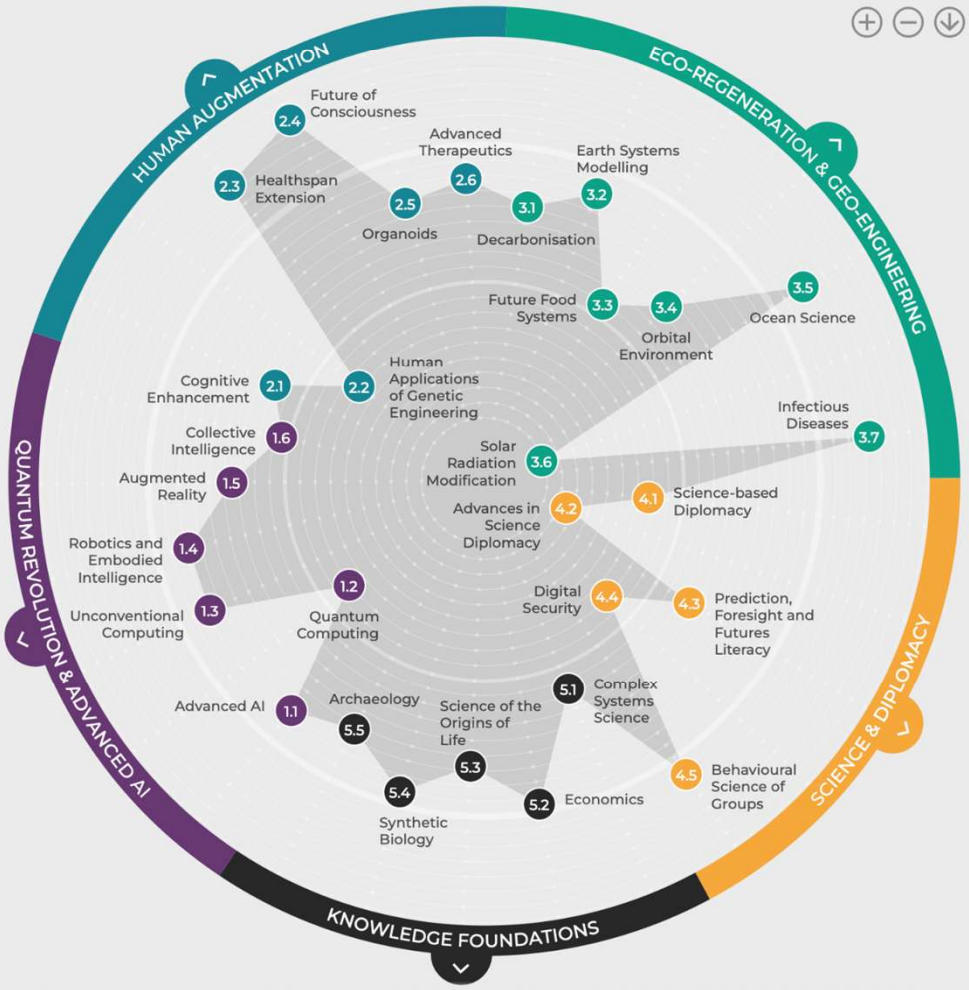

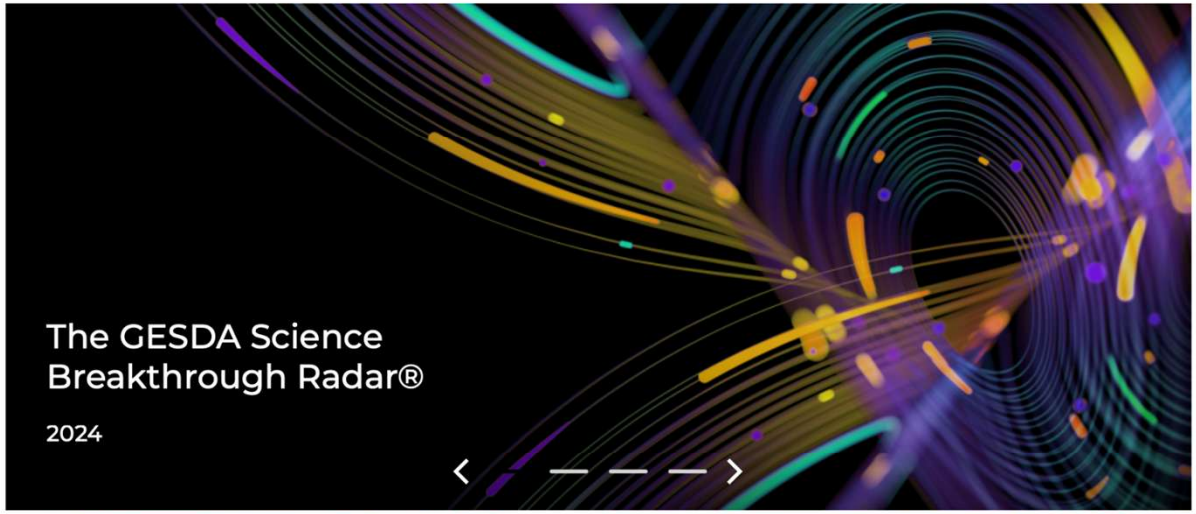

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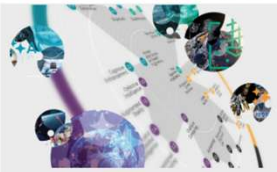

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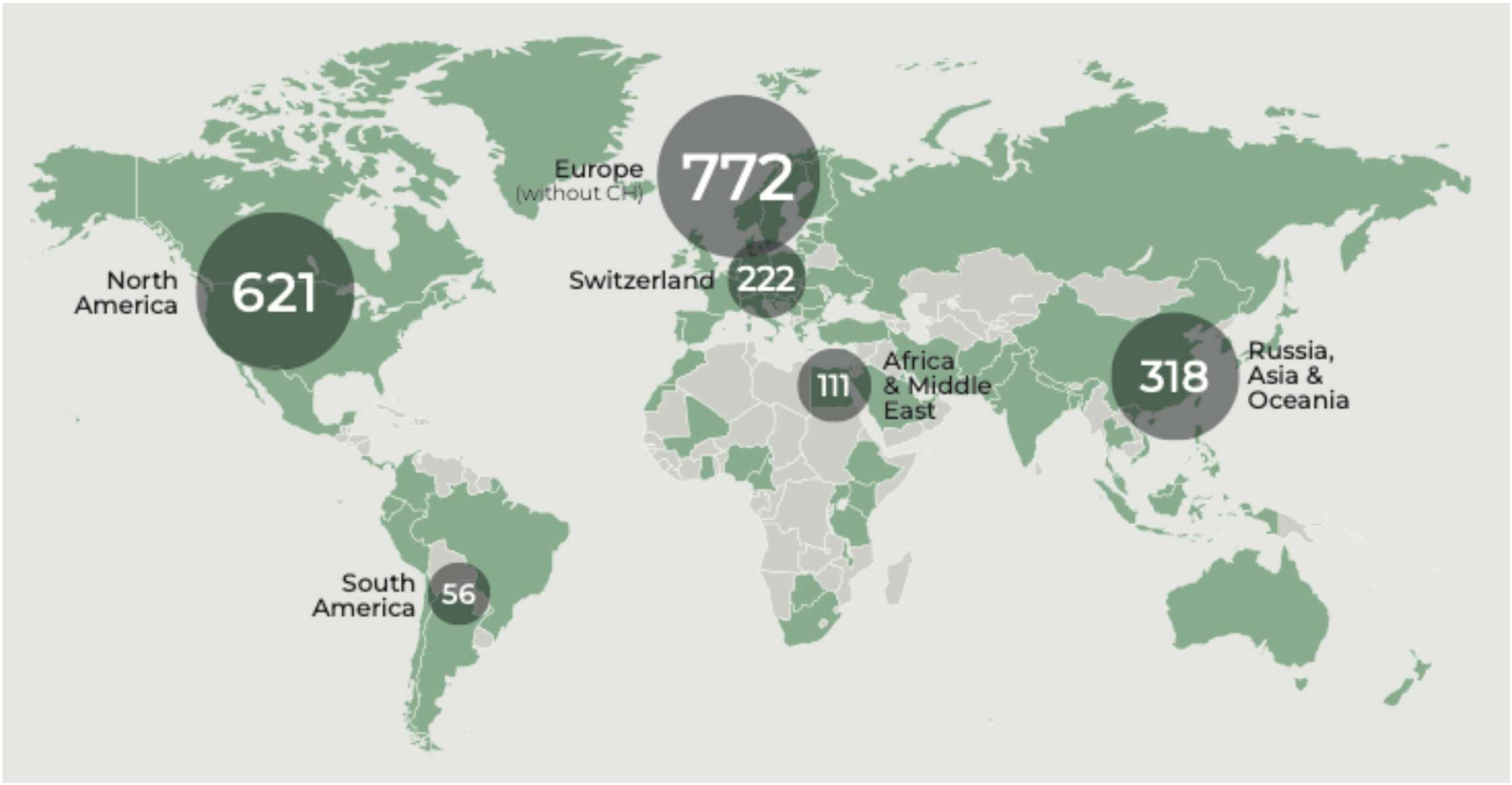
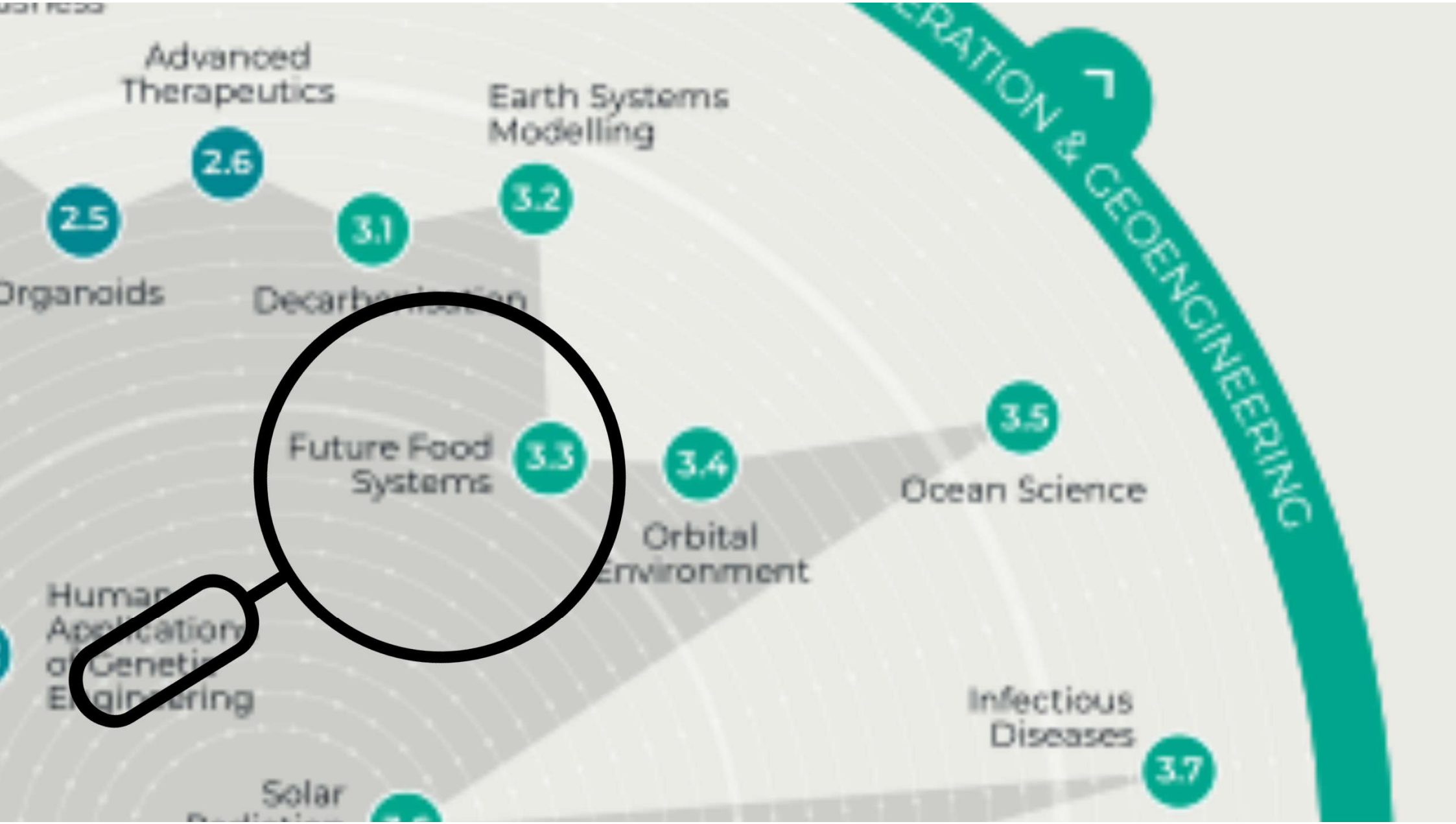

Europe
(without CH)
772
North
America
621
Switzerland
222
111
Africa
& Middle
East
318
Russia,
Asia &
Oceania
South
America
56

Antizipations potenzial

Ungewissheit über künftige wissenschaftliche Durchbrüche

Transformative Wirkung wissenschaftlicher Durchbrüche für Wissenschaft, Technologie und Gesellschaft

Handlungsspielraum in der Gegenwart


Advanced Therapeutics
2.6
Earth Systems Modelling
3.2
2.5
3.1
Organoids
Decarbonisation
Future Food Systems
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Ocean Science
Orbital Environment
Infectious Diseases
3.7
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RATION & GEOENGINEERING

Future Food Systems

CHAIR:

Nam-Hai Chua

Andrew W. Mellon Professor Emeritus and Head of Plant Molecular Biology, the Rockefeller University, New York

CONTRIBUTORS:

Rodrigo Ledesma Amaro, Kellye Eversole, Jonathan Jones, Jiayang Li, Lone Dybdal Nilsson, Rajeev Ram, Michael Strano, Yuexin Yang, Cuilin Zhang

ANTICIPATION SURVEY RESULTS

3.3.1 Engineering crops and livestock

A combination of conventional breeding and newer technologies such as CRISPR genetic editing may significantly enhance the resilience of crops and livestock to changing conditions, and the nutrient availability they offer.[5]

Biofortification, where conventional plant breeding or modern biotechnology techniques bolster the amount of iron and other essential minerals and vitamins on offer, is an increasingly promising option.[6] Although the factors influencing both the nutrient content of crops and the scale of their absorption by human bodies remain incompletely understood,[7] many successes in biofortification have already been achieved through conventional breeding, and the potential of genetic engineering technologies (gene stacking, where two or more novel and useful genes are introduced into a single plant line, is one example) remains largely untapped.[8]

Genetic engineering can also boost crop yields, for example by re-engineering photosynthesis to boost energy capture.[9] This can be coupled with improved crop resilience to help cope with droughts,[10] pests and disease, which together account for 43 per cent of global crop loss.[11,12] Domestication of resilient wild species[13] could increase agricultural resilience to changing environmental conditions.[14] RNA sprays, which deliver RNA-based vaccines against diseases to crops, have considerable potential for improving resilience against pathogens.[15]

Engineering the plant bacterial microbiome can enhance crop production and resilience.[16] That is especially true for the rhizosphere microbiome associated with plant roots, which can help crops resist disease.[17] There is also similar potential to engineer livestock. Already, researchers have used genetic engineering to develop fast-growing AquAdvantage salmon (which have been commercialised), pigs resistant to viral infections and dairy cattle resistant to mastitis.[18]

5-YEAR HORIZON

Genetic engineering of plant metabolism improves efficiency

Advances in fundamental understanding of photosynthesis processes enable genetic engineering of the system to improve efficiency. AI identifies optimal targets for genetic engineering of the plant microbiome.

10-YEAR HORIZON

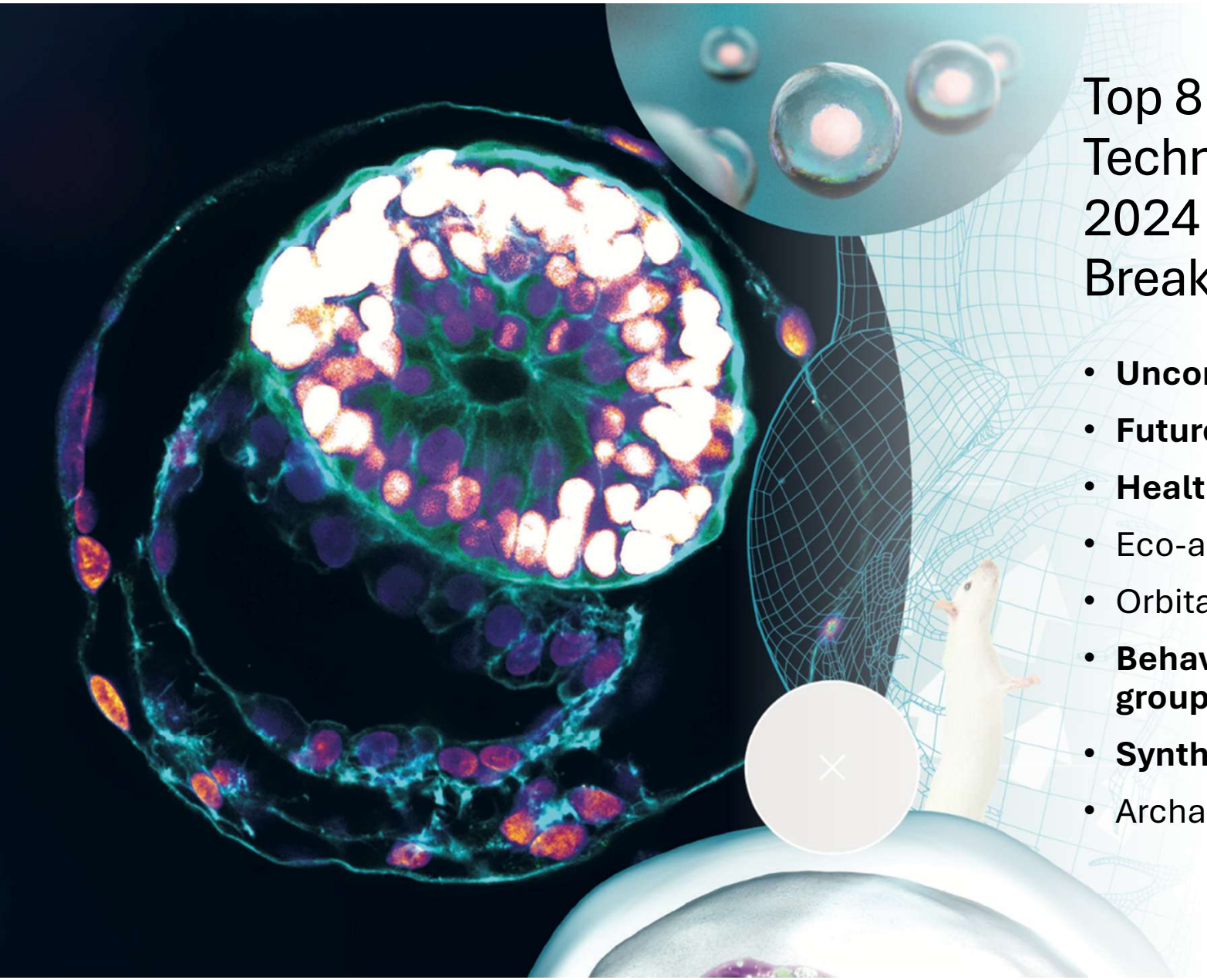
Engineering approaches become mainstream

Crops with enhanced photosynthesis efficiency are routinely engineered. First commercial RNA vaccines for crop diseases are created. Meat from genetically engineered livestock is widely available. First food proteins are derived from CO_2 by genome-edited micro-organisms.

25-YEAR HORIZON

New foods come to market

Multiple new strains of cereals are domesticated by genetic engineering from wild species. Understanding of the plant microbiome allows symbiotic relationships to be engineered to maximise crop resilience and yield. Global lab-grown meat that replicates the sensory experience of animal meat achieves price parity.



Top 8 der erwarteten Technologietrends im 2024 GESDA Science Breakthrough Radar®

- **Unconventional computing**
- **Future of consciousness**
- **Healthspan extension**
- Eco-augmentation
- Orbital environment
- **Behavioural science of groups**
- **Synthetic biology**
- Archaeology

THE FUTURE OF ADVANCED AI

ADVANCED AI

5 JAHRE

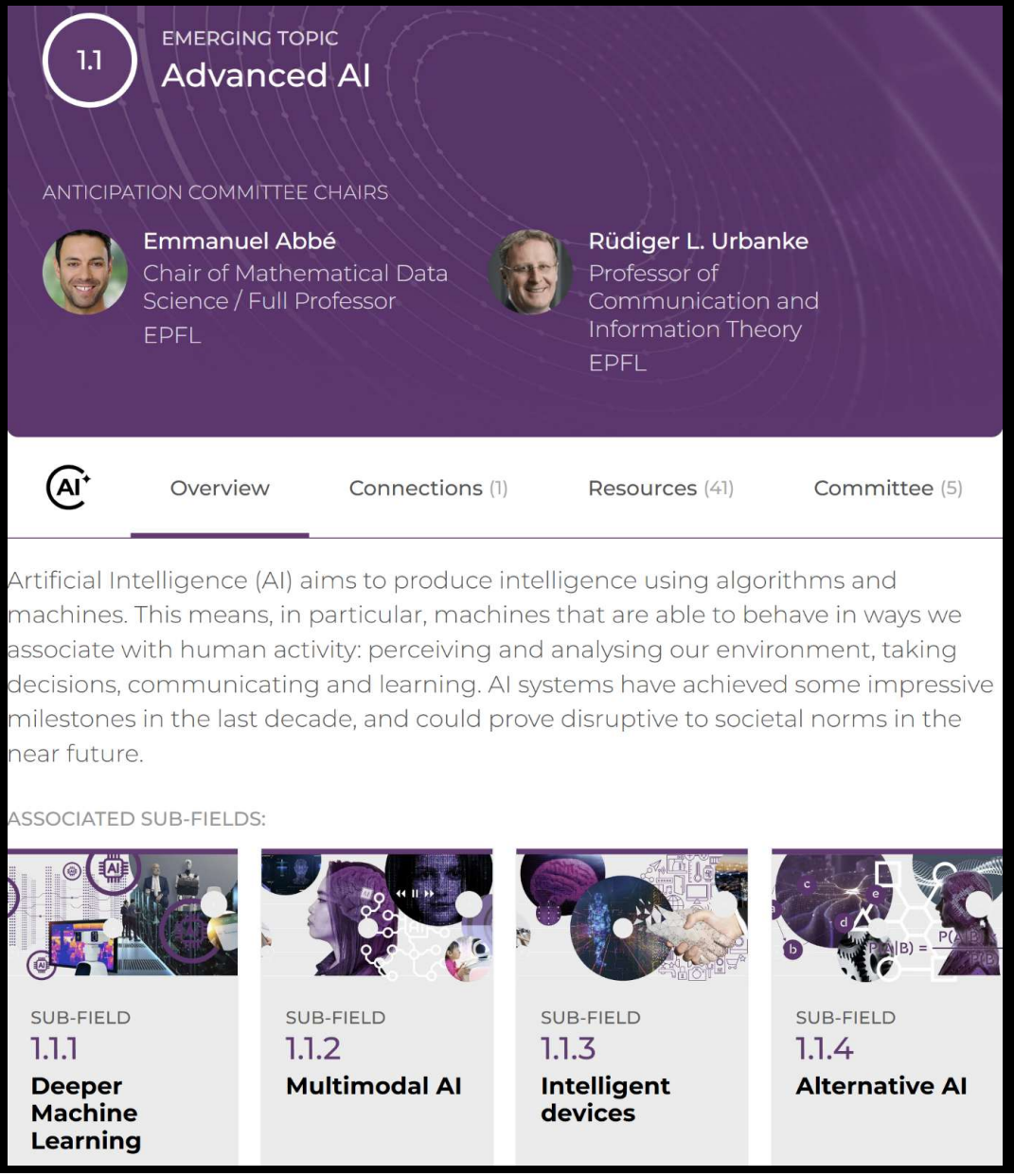
Dominanz des Deep Learning, Multimodalität und allgegenwärtige (ubiquitous) einfache KI-Modelle

10 JAHRE

Skalierungsgrenzen (?) und hybride Systeme. Multimodale KI-Systeme verstehen die physikalische Welt, wissenschaftliche Beschleunigung

25 JAHRE

allgemein intelligente KI-Systeme, die Anpassungsfähigkeit, Verallgemeinerbarkeit, gesunden Menschenverstand und fortgeschrittenes logisches Denken aufweisen

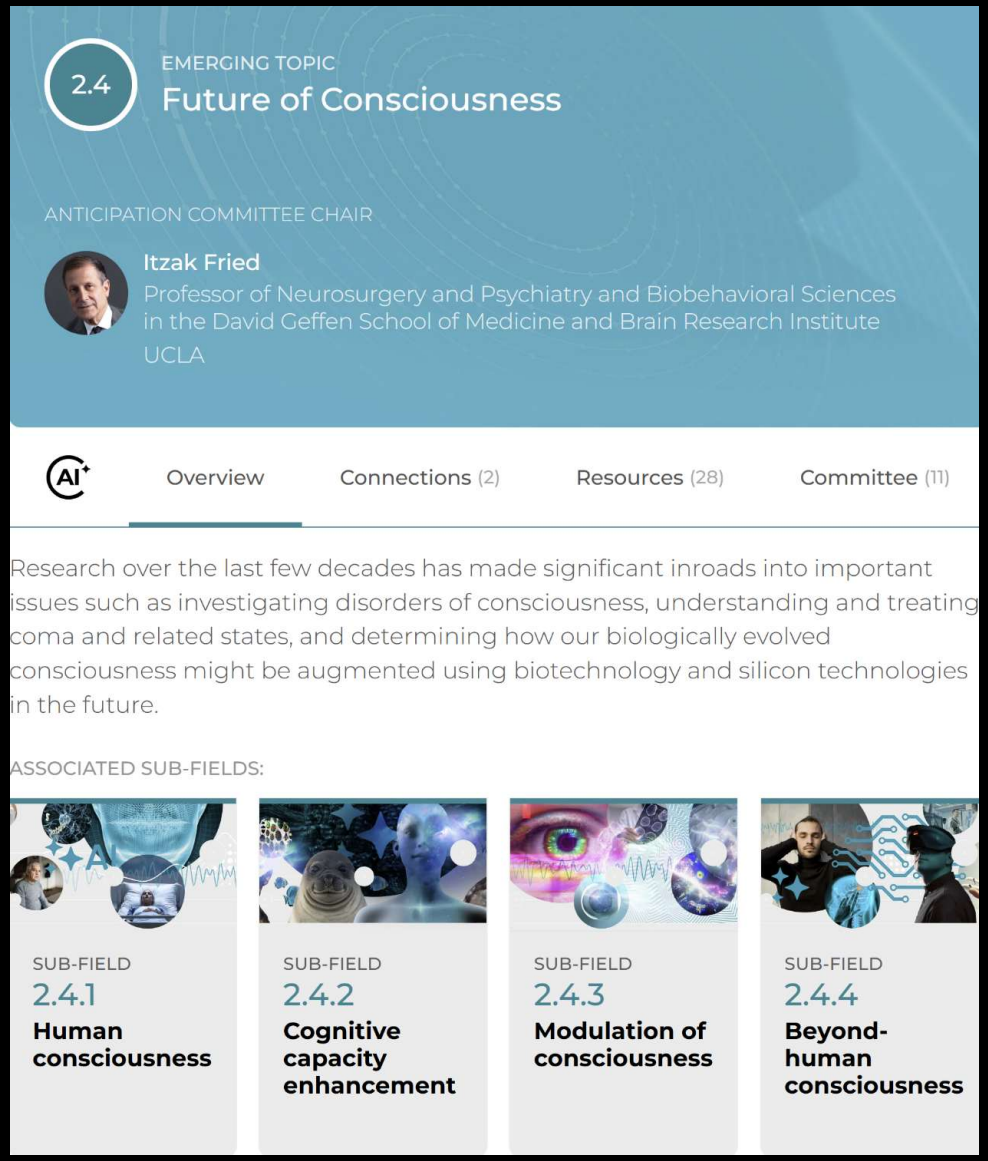


THE FUTURE OF CONSCIOUSNESS

5 JAHRE
Fortgeschrittene Hirnzustandsdiagnostik durch KI-techniken
Frühzeitige Erkennung von bewusstseinsstörenden Krankheiten

10 JAHRE
Messung und Bewertung des tierischen Bewusstseins
Erforschung des maschinellen Bewusstseins, da KI-Systeme immer besser in der Lage sind, menschliches Verhalten nachzuahmen

25 JAHRE
Entstehung des "Bewusstseins-Engineering" durch Neurobiologie und Neuro-AIVerwischung der Grenzen zwischen dem individuellen Selbst und zwischen natürlicher und künstlicher Realität



HEALTHSPAN EXTENSION

5 JAHRE - PERSONALISIERTE GESUNDHEITSSTRATEGIEN

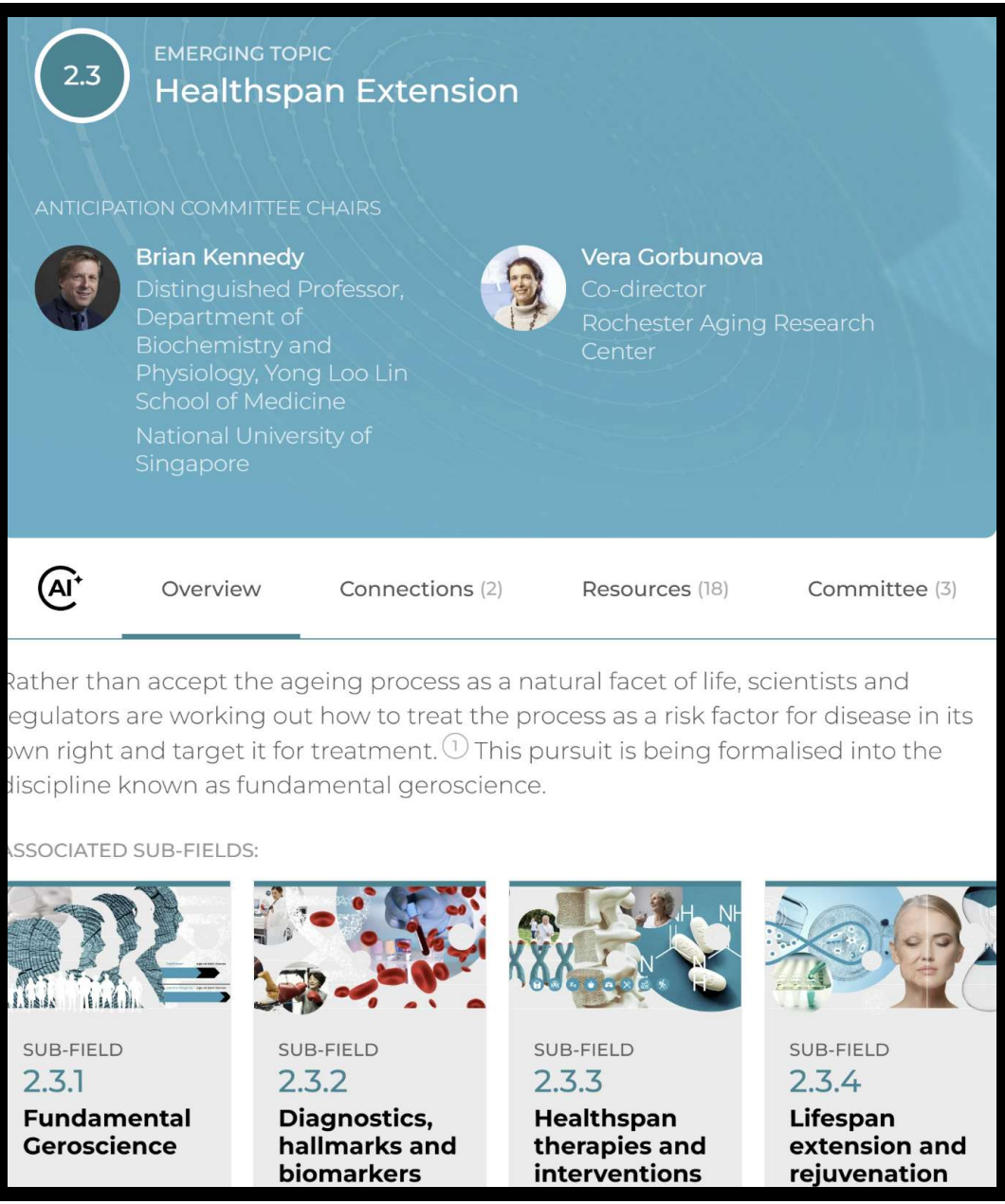
Wir werden in der Lage sein, Gesundheitsmaßnahmen auf den Einzelnen zuzuschneiden, was die präventive Versorgung verbessert und die altersbedingte Belastung der Gesundheitssysteme verringert.

10 JAHRE - FORTSCHRITTE IN DER REGENERATIVEN MEDIZIN

Signifikante Fortschritte bei Zelltherapien werden neue Lösungen für altersbedingte Krankheiten bieten und die Produktivität und Lebensqualität alternder Bevölkerungen verbessern

25 JAHRE - GRUNDLEGENDE MAßNAHMEN GEGEN DAS ALTERN

Potenzial für Durchbrüche, die die Ursachen des Alterns angehen, zu gesünderen Bevölkerungen führen und die globale Demografie verändern.



BEHAVIOURAL SCIENCE OF GROUPS

5 JAHRE - VERBESSERTE KONFLIKTVORHERSAGE

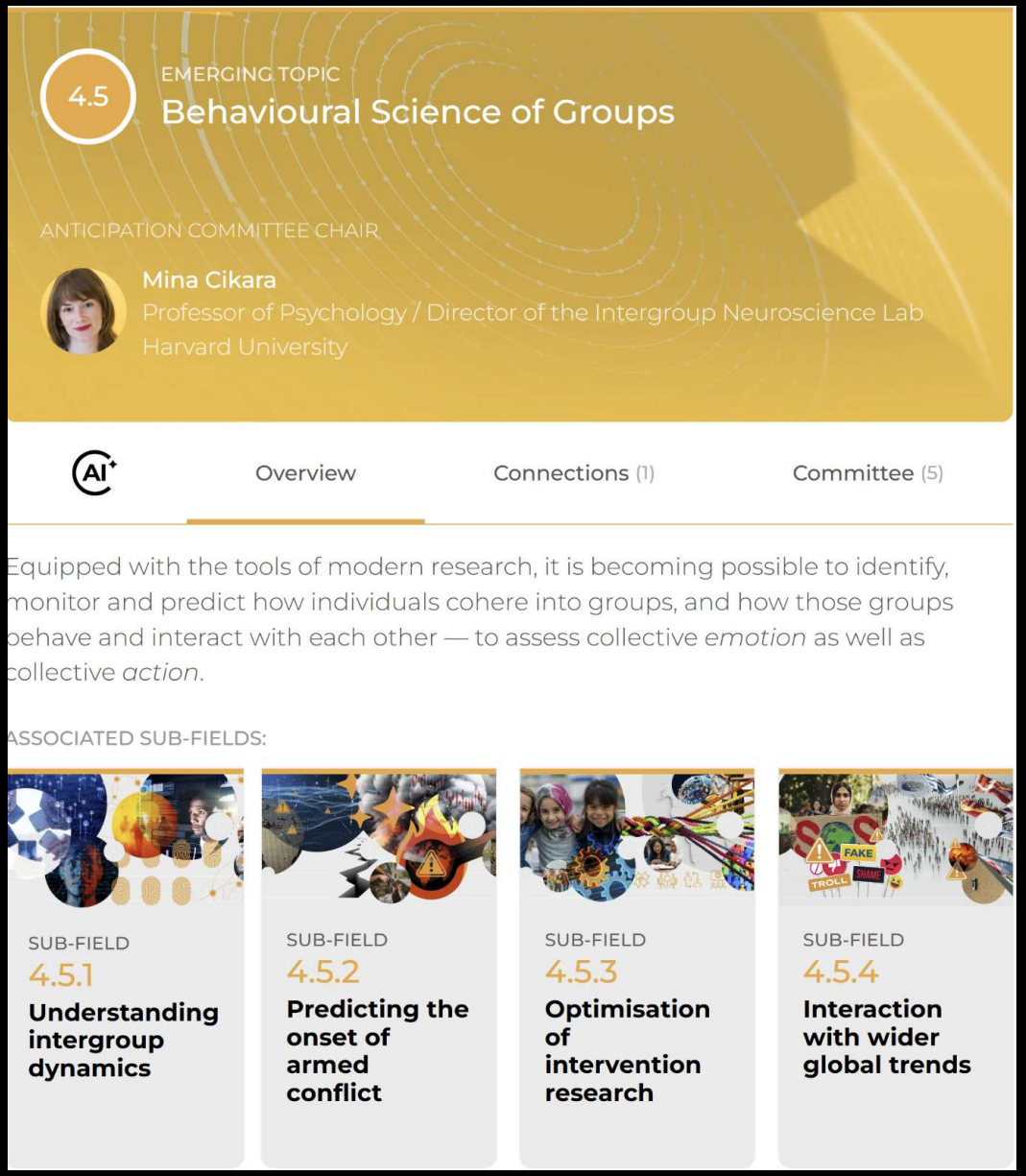
Fortgeschrittene datengestützte Modelle werden unsere Fähigkeit verbessern, den Ausbruch bewaffneter Konflikte vorherzusagen, was präzisere und rechtzeitige Interventionen ermöglicht

10 JAHRE - OPTIMIERUNG VON GRUPPENINTERVENTIONEN

Ein verfeinertes Verständnis der Dynamik zwischen Gruppen ermöglicht die Entwicklung optimierter Interventionsstrategien, die die Zusammenarbeit fördern und Konflikte entschärfen

25 JAHRE – PREDIKITIVE MODELLIERUNG GESELLSCHAFTLICHER VERÄNDERUNGEN

Umfassende Modelle des kollektiven Verhaltens ermöglichen die Vorwegnahme groß angelegter sozialer und politischer Veränderungen und erlauben eine proaktive Steuerung.

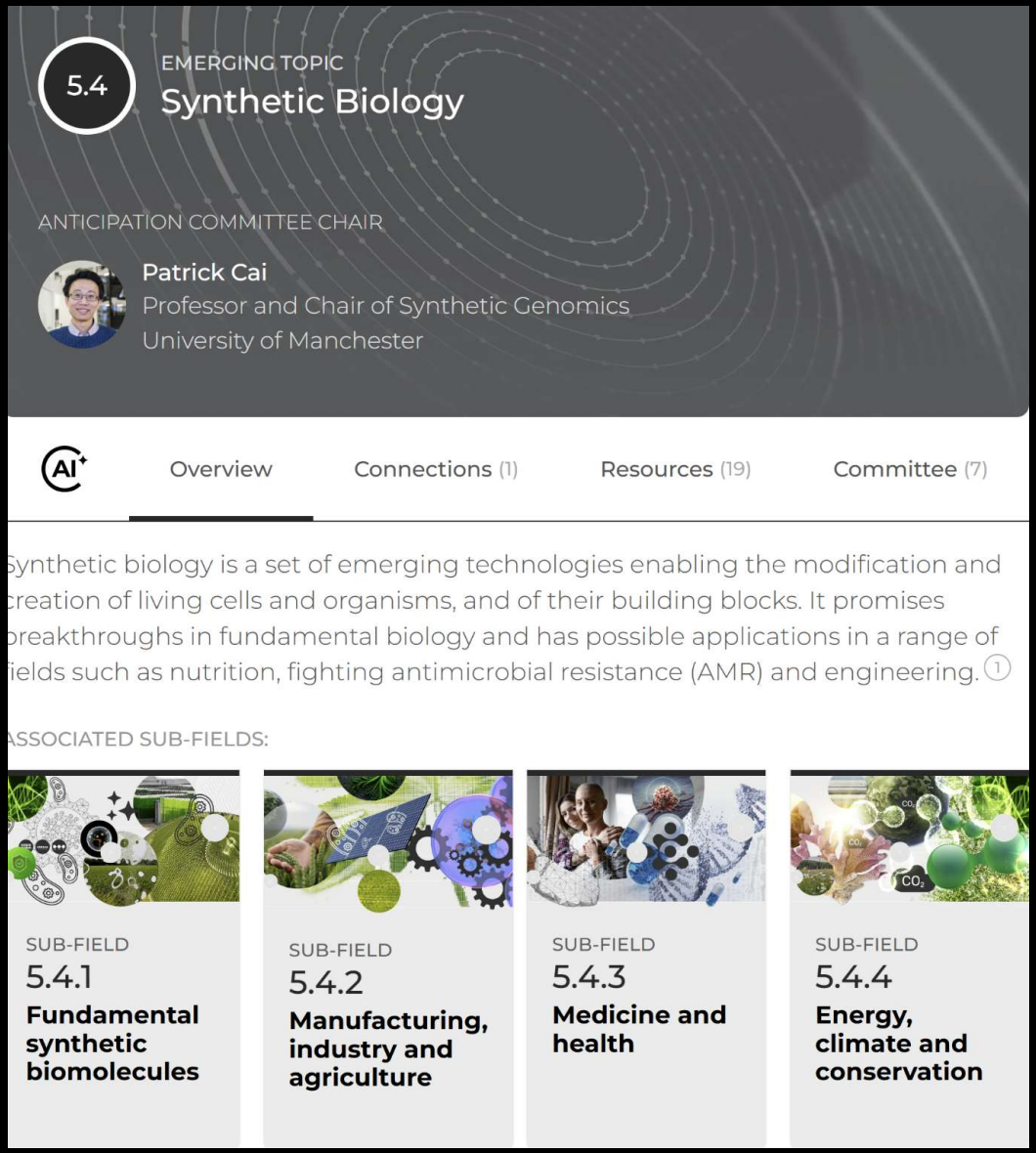


SYNTHETIC BIOLOGY

5 YEARS
Kostengünstige Synthese längerer DNA-Sequenzen, die sich über Hunderte von Kilobasen erstrecken Ausweitung der Anwendungen (Herstellung von Chemikalien, Landwirtschaft, Medizin usw.)

10 JAHRE
Kostensenkung bei der DNA-Synthese und Entwicklung allgemeiner Plattformen für die synthetische BiologieFortschritte beim komplexen rationalen Design

25 JAHRE
KI-unterstützte Synthese, z. B. durch Bereitstellung von Anweisungen in natürlicher Sprache für die MolekülkonstruktionProgrammierbare Organproduktion aus Stammzellen für die Transplantation beim Menschen



The Open Quantum Institute

An initiative hosted by CERN, born at GESDA, supported by UBS.

OQI is a multilateral governance initiative, bringing together academia, industry, diplomacy and education to promote global and inclusive access to quantum computing and the development of applications for the benefit of humanity.

The collaborative platform developing quantum computing for the benefit of all.

⟶ Intelligence Report on Quantum Diplomacy for the SDGs

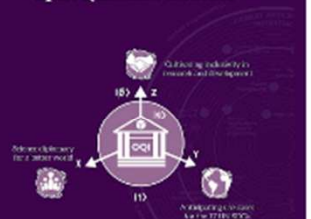
⟶ OQI Progress Report

⟶ Use Case White Paper

Solution Idea

Quantum Revolution & Advanced AI

Open Quantum Institute



Providing global and inclusive access to state-of-the-art quantum technology

The Open Quantum Institute
Spearheading partners

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GESDA Solutions

20Jun23

Academic

Supporting letters from

- CERN
- EPFL
- ETHZ
- Forschungszentrum Jülich
- Imperial College London
- National Institute for Theoretical and Computational Sciences (NITheCS)
- Quantum Delta NL
- Raman Research Institute
- University of Calgary
- University of Copenhagen
- University of Geneva
- University of KwaZulu-Natal
- New York University Abu Dhabi
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Diplomacy

Permanent Representatives from a number of countries are actively helping to shape the multilateral relevance of the future Open Quantum Institute

Australia	India	Netherlands
Austria	Italy	Pakistan
Brazil	Japan	Singapore
Chile	Kenya	Slovenia
Czech Republic	Malta	Switzerland
Egypt	Mexico	UK
France	Morocco	US

Intergovernmental Organizations and **NGOs** have been actively helping in defining possible Quantum for SDG use cases

- Global Alliance for Improved Nutrition
- International Committee of the Red Cross
- Periodic Table of Food Initiative
- SDG Lab
- UN Habitat
- UNFCCC
- World Food Program
- World Health Organization
- World Intellectual Property Organization

Impact

Supporting letters from

- Alpine Quantum Technologies
- AWS
- IBM
- IQM Quantum Computers
- Microsoft
- Oxford Quantum Circuits
- PASQAL
- Strangeworks
- NVIDIA

Citizens

Strategic partners

- Fondazione Compagnia di San Paolo
- XPRIZE

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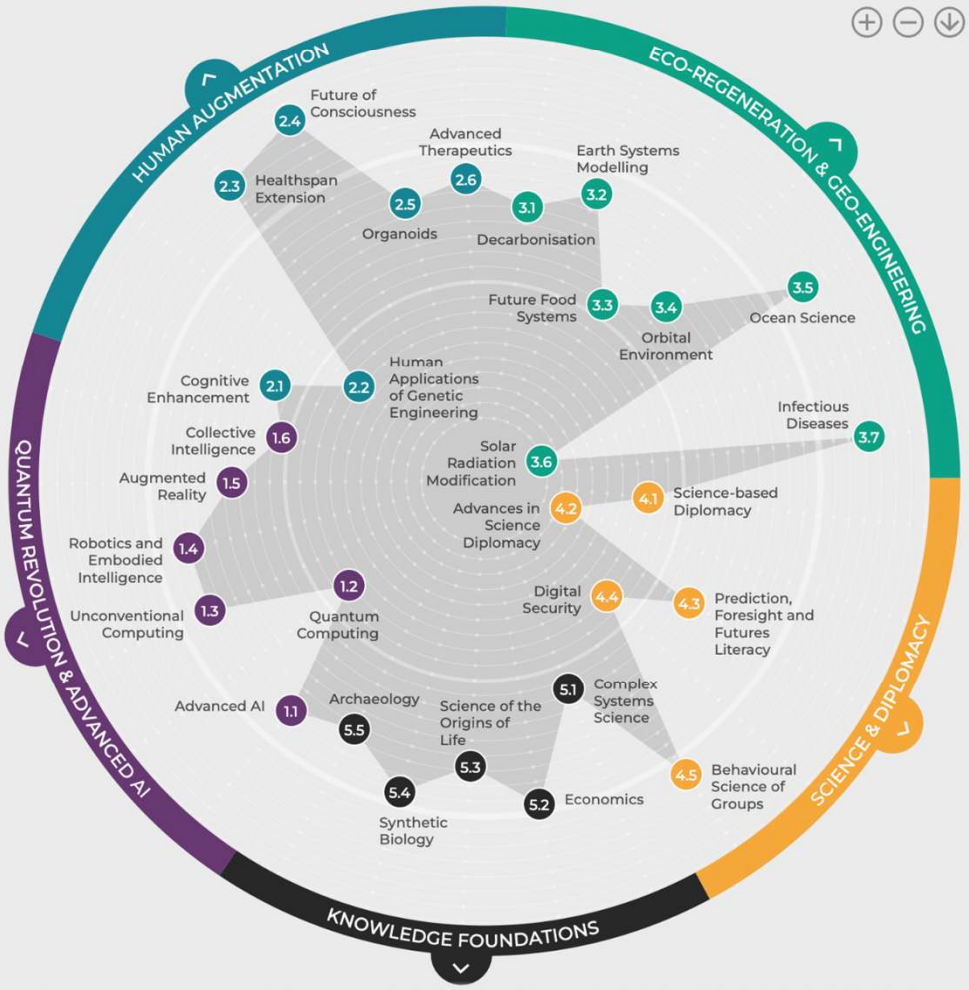

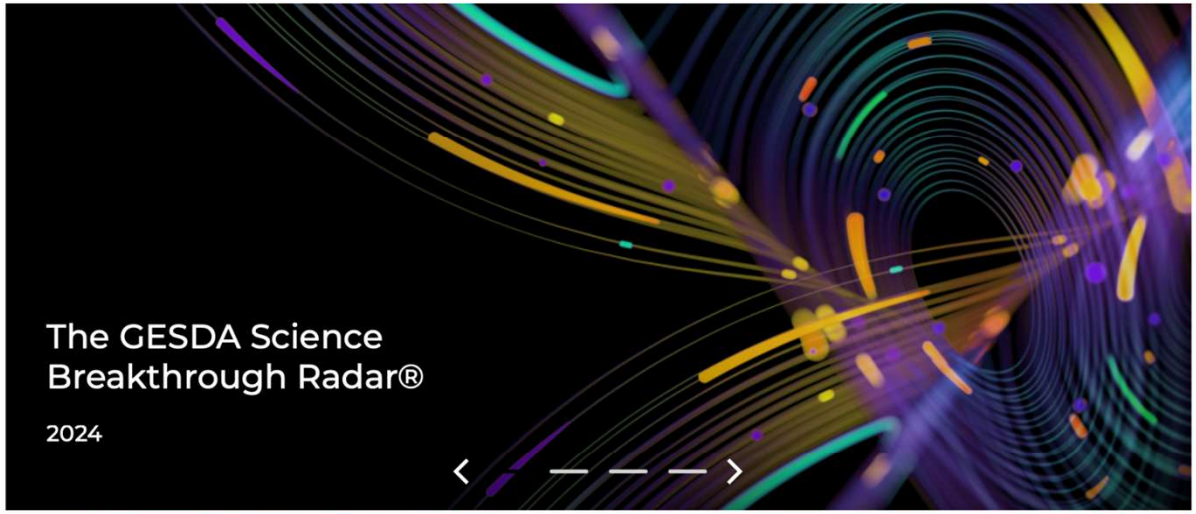

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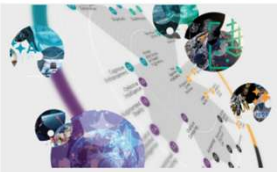

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MARTIN.MUELLER@GESDA.GLOBAL

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