

GAFOE 2021: Next Grand Challenges Breakout – Results

Floor 1, Table 1

Asking us to pick the top 3 is not fair. Who is this to benefit and how do you prioritize across this group?

Premise: Engineers want to help people

Who are the people we are helping?

Grand challenge: “help all the people”

Subgroups: sustainability, health, security, joy of living (fun! 😊)

Survival

Climate Change

- Pandemic management, prevention, resilience, recovery
- Engineer better/faster medicines, robust supply chain
- Develop carbon sequestration methods
- Provide access to clean water
- Manage the nitrogen cycle
- Water/materials management, recycling, reutilization
- Make solar energy economical
- Provide energy from fusion

Education

- Advance personalized learning/Science education + communication/Communicate what we do better/misinformation
- Enhance virtual/augmented reality

First-world problems??

- Reverse-engineer the brain
- Advance health informatics, early detection of diseases, pandemic
- Restore and improve urban infrastructure
- Secure cyberspace
- Prevent nuclear terror
- Space exploration

How to select the appropriate solution:

- Low-end but widespread scientific tools
- Harnessing of Big Data “find the problem” from big data
- IPAT eqn: population + affluence + technology (can be affected)
- Engineer the high-end tools of scientific discovery

Floor 1, Table 2

Sustainable circular economy with sustainable interconnections and recycling

Engineer better medicines affordable, scalable, flexible

Secure cyberspace

Engineer the tools of scientific discovery (ML, automation, data science, quantum computing)

Floor 1, Table 3

Circular economy

Engineer smart medicine

Smart, resilient infrastructure

Access sustainability in space

Floor 1, Table 4

Diversification of mobility solutions from electric to efuels to new concepts

Communicate science to people in a positive way. Fight fake news.

Humanized high-throughput testing platforms for drug development, disease-spreading progress

Technologies for denser population in cities

Floor 1, Table 5

Clean and abundant energy:

--Realize Desertec 3.x (hydrogen/eFuel production by African Sahara states

--Make eFuels available and cheap for the masses (for cars, trucks, aviation...)

--Provide energy from fusion

--Next-gen nuclear power

--Make solar energy economical

--Make renewable energy scalable and economical

Carbon removal:

--Understand effects of climate engineering

--Scale-up direct air capture processes

--Develop carbon sequestration methods

--Develop economical and scalable carbon capture methods for sequestration or upgrading

--Reduce material usage and environmental impact of production

Secure cyberspace

****The role of technology in society****

--Preparation for future pandemics (platforms, dissemination, education)

--Educate public on technology

--Fight disinformation campaigns

--Pragmatic science/tech in curriculum

Floor 1, Table 6

Scientific knowledge (sharing/handling and validation)

--Data curation and quality benchmarking

--Reproducible experiments

--Standardization of reporting

--Advance health informatics

--Engineer the tools of scientific discovery

--Secure cyberspace

--Advance personalized learning

(Personalized) health care

--Engineer better medicines

- Restore and improve urban infrastructure
- Provide access to clean water
- Prevent biological terror/pandemics

(Fight) climate change (fast)

- Provide energy from fusion
- Hydrogen infrastructure
- Develop carbon sequestration methods

Floor 1, Table 8

Top 3: 1) Resilience in the supply chain. 2) Improved education and information equity, 3) Accelerate adoption of low-carbon technology

Next tier: Advance personalized learning, Develop carbon sequestration methods

Floor 2, Table 1

Engineer a secure, equitable, and ethical cyberspace

Advance affordable and equitable personalized medicine

Engineer sustainable systems