

Extending human perception to new scales (2023)

Intro:

Policymakers strive to establish future-focused policies that set the pathway and conditions for a better future and society. However, developing policy that effectively considers a range of possible future state is often easier said than done.

Especially as our world is in transition. We don't live in an era of change, but in a change of eras.¹ Current systems are nearing their end and no longer meet the demands that we, as humans, place on them. The systems must now reinvent themselves, but we humans must reinvent ourselves too.

The Futures Gardens project supports policy makers in their efforts of envisioning and working with these possible transformational futures. The Futures Gardens team scans for signs of new indicating these possible futures, makes these possible futures come alive, and checks with citizens how they perceive these possible futures.

Context:

Extending human perception to new scales Current policies are increasingly addressing issues and objects that are scales and distances beyond our direct human perception; like exploiting outer space resources, deep-sea mining and nanotechnologies². New technologies could potentially be providing ways of experiencing or “perceiving them” through remote sensors, visualisations or virtual reality³ to not only experience, but possibly also relate to and empathise with them⁴. As citizen engagement in policymaking becomes increasingly important, policymakers will have to develop new ways to engage with citizens in relating to our universe with different scales and remote spaces. (>> Extending perception)

Headline:

Our interconnected humanity and our relationship to the ecosystems of planet earth and all life.

Horizon scans:

- 1.1. Life communication / eavesdropping on life's whisper – can we engage in the conversation of various life-forms and ecosystems? (insights from: plant communication, animal communication, bacterial communication, belowground chemical communication, ecosystems communication, quantum teleportation)
- 1.2. Permeating intelligence – current civilization revolves around a relatively narrow view of intelligence. Would extending this view change our relation to ourselves, non-human beings and environment at large? Broadening perspectives. (insights from: prosocial behaviour in animals / emotional plasticity, hive minds, interoception, organoid intelligence, multiple intelligence)

¹ Rotmans, J. (2023). Embracing chaos; how to deal with a world in crisis? Emerald Publishing Limited 9781837536351, 183753635X

² Feichtner, I. (2019). Mining for humanity in the deep sea and outer space: The role of small states and international law in the extraterritorial expansion of extraction. *Leiden Journal of International Law*, 32(2), 255-274. doi:10.1017/S0922156519000013

³ <https://news.arizona.edu/story/nano-2020-scaling-nanotechnology-virtual-reality>

⁴ Morison, A. M., Woods, D. D., & Murphy, T. (2015). Human-robot interaction as extending human perception to new scales. In R. R. Hoffman, P. A. Hancock, M. W. Scerbo, R. Parasuraman, & J. L. Szalma (Eds.), *The Cambridge handbook of applied perception research*, Vol. 2, pp. 848–868). Cambridge University Press. <https://doi.org/10.1017/CBO9780511973017.051>

- 1.3. Citizens of planet earth / we are 'Unizens' – we live in concentric bubbles of identity from family to nation and the world. We can also see ourselves more as
 - citizens of the planet / universe? One humanity. (insights from: overview effect, we are made of stars, 'seeing' the cosmos)
 - 1.4. Deep and far away ecosystems – most of our attention on ecosystems are related to life on the surface of Earth. Can we also relate to life deep within the earth's oceans, deeply within the earth and potentially on asteroids? (insights from: exploiting the deep ocean, deep biosphere, asteroid mining and search for life)
 - 1.5. Microbial and fungi regeneration – microbes and fungi have long been mostly associated with pathogens and diseases. Are we ready to relate to and support these interconnected systems in radically different ways? (insights from: microbial proteins, microbial fuel, microbial carbon capture, fungi economy,

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** Futures garden immeasurably transforms culture, policy and behaviour. **

Annex – Horizon Scans

Theme **Extending human perception to new scales**

Our interconnected humanity and our relationship to the ecosystems of planet earth and all life.

2.1. Life communication/ Eavesdropping on life's whispers

Can we engage in the conversations of various life-forms and ecosystems?

Plant communication

“Many different plant species make ultrasonic sounds to communicate stress. It’s the latest evidence showing how plants “talk” with everything from predators to pollinators.” [\(article\)](#)

Animal communication

The field of digital bioacoustics—which is accelerating exponentially and unveiling fascinating findings about communication across the tree of life—is now approaching these animals and asking not “Can they speak like humans?” but “Can they communicate complex information to one another? How are they doing so? What is significant to them?”

“Science fiction writer Matthew De Abaitua speculates about building a machine that will let him talk with animals” [\(video\)](#).

Bacterial communication

When biofilms form, bacteria cells employ chemical signal waves analogous to radio transmissions to encode information for their descendants that helps coordinate colony formation. In that phenomenon, whether a given cell attaches to a surface is influenced by the specific shape of those oscillations — much like the way information is stored in AM and FM radio waves. [article](#)

Belowground chemical communication

Soil microbes communicate with each other and with other organisms, such as animals or plants, by producing different kinds of molecules: Volatile molecules can travel easily through small pockets of air in the soil and can also travel really far. It is like long-distance communication; Other molecules are soluble so they can dissolve in water, allowing the communication between organisms close to each other. The organisms that receive this communication can respond in different ways, such as by growing faster or producing other molecules in response.

2.2. Permeating intelligence

Current civilization revolves around a relatively narrow view of intelligence. Would extending this view change our relation to ourselves, non-human beings and the environment at large? Broadening perspectives

Prosocial behaviour in animals and humans/ Emotional plasticity

“Human culture and language may be the result of 'self-domestication': an evolutionary process that leads to less aggressive and more prosocial individuals. A research team argues that elephants -- like humans and bonobos -- may also be self-domesticated” ([article](#))

“People and other great apes are known for their willingness to help others in need, even strangers. Now, researchers have shown for the first time that some birds -- and specifically African grey parrots -- are similarly helpful.” ([article](#))

“The social life of corvids [birds] is a crucial factor for whether the birds act generously or not” ([study](#))

Our rational mind is truly embodied, and without this emotional embodiment we have no preferences. In order for our minds to go beyond syntax to semantics, we need feelings. And our ancestral minds were rich in feelings before they were adept in computations...The brain that 'feels' precedes the brain that 'thinks'. [article](#)

Hive minds

“By 2040, numerous people will be part of brain hives. Real time sharing of emotions will play a key role in creating communities of trust, diverse in their focus and culture. Brain-to-brain interfaces will accelerate and diversify intra-community sharing, creating strong collective neurofeedback loops, gradually conducting to convergent behaviours and co-dependence. Some prominent hives in particular and the culture of sharing in general will be challenging the fabric of society, from the structure of companies, to life-work separation or the definition of family” ([Transhumanist revolutions](#))

Interoception

“How our brains interpret signals from within the body has a surprisingly big influence on the mind, an insight that is leading to new ways to tackle conditions like depression, anxiety and eating disorders” ([article](#))

Organoid intelligence

“Scientists teach brain cells to play video game Pong” ([article](#))

Multiple intelligence

In order to capture the full range of abilities and talents that people possess, Gardner theorizes that people do not have just an intellectual capacity, but have many kinds of intelligence, including musical, interpersonal, spatial-visual, and linguistic intelligences. ([article](#))

2.3. Citizens of planet earth/ We are “Unizens”

We live in concentric bubbles of identity from family to nation and the world. Can we also see ourselves more as citizens of the planet / universe? One humanity.

Overview effect

The overview effect describes the change that occurs when astronauts see the world from above, as a place where borders are invisible, where racial, religious and economic strife are nowhere to be seen. The blue and green Earth appears alive, and yet denuded of people. The atmosphere reveals itself to be what it is: an impossibly thin onion skin that protects us from the killing void of space and yet appears penetrable, destructible. [article](#)

Technology can provide a taste of the overview effect for those who can't afford a trip into space. A virtual reality series from Felix and Paul Studios, for example, filmed aboard the International Space Station, gives viewers an overview effect on VR headsets while they get a look at how astronauts live while orbiting the Earth. A Unitarian Universalist minister in Colorado, Jeremy Nickel, uses the effect in virtual meditations. Stott, herself, is particularly intrigued by SpaceVR, an attraction where participants strap on headsets and get in float tanks to take in views of Earth and experience zero gravity at the same time. [article](#)

We are made of stars

Though the billions of people on Earth may come from different areas, we share a common heritage: we are all made of stardust! From the carbon in our DNA to the calcium in our bones, nearly all of the elements in our bodies were forged in the fiery hearts and death throes of stars. [NASA](#)

'Seeing' the Cosmos

Data from NASA's James Webb Space Telescope (JWST) began returning images in July 2022, and is poised to deepen humans' sensibility of the cosmos and ourselves. The telescope's deep field resolves distant star clusters in unparalleled detail. These images could help astronomers model the 'cosmic spring' that led to the formation of galaxies through gravitational mechanisms and life itself. [article](#)

2.4. Deep and far away ecosystems

Most of our attention on ecosystems are related to life on the surface of Earth. Can we also relate to life deep within the earth's oceans, deeply within the earth and potentially on asteroids?

Exploiting the deep ocean/ (Deep Sea mining)

The treaty known as the BBNJ (Marine Biodiversity of Areas Beyond National Jurisdiction), signed in 2023 provides a framework for setting up protected areas in the high seas, sometimes known as international waters. It's been seen as crucial for supporting the aim to protect 30% of the oceans by the year 2030. The treaty could help to protect the oceans from potential environmental damage caused by mining the seabed for metals such as cobalt, manganese and nickel. ([article](#))

"[Life in the deep ocean](#)" has also been explored in a Google expeditions project.

Deep biosphere

"In recent years, a massive international team of scientists revealed how billions upon billions of microorganisms live miles beneath Earth's subsurface...first glances suggest that the genetic diversity of life below the surface might be comparable to, or perhaps even exceed, life above the surface." ([article](#))

The fact that complex surface life forms can also survive indefinitely in the deep subsurface is good news for the search for life on planets and moons in our solar system. A similar process of migration could have transported life forms to the deep subsurface long before the surface conditions became inhospitable on Mars, for instance. [article](#)

Asteroid mining and search for life

Could the Blueprint for Life Have Been Generated in Asteroids? Using new analyses, scientists have just found the last two of the five informational units of DNA and RNA that had yet to be discovered in samples from meteorites. While it is unlikely that DNA could be formed in a meteorite, this discovery demonstrates that these genetic parts are available for delivery and could have contributed to the development of the instructional molecules on early Earth. ([NASA, 2022](#))

2.5. Microbial and fungi regeneration

Microbes and fungi have long been mostly associated with pathogens and diseases. Are we ready to relate to and support these interconnected systems in radically different ways?

Microbial proteins

A biotech start-up is developing a sustainable protein made from fermented bacteria ([Bloomberg, 2023](#))

Microbial fuel

“Natural soils contain a mixture of different bacterial strains that are capable of direct electron transfer and can be used in fuel cells to generate bioelectricity.” ([University of Bayreuth, 2022](#))

Microbial carbon capture

A microbe discovered in a volcanic hot spring gobbles up carbon dioxide “astonishingly quickly” ([Guardian, 2023](#))

Fungi economy

Although fungi has long been mostly associated with pathogens and diseases, it is now emerging as an important way to sustainably produce resilient sources of food, feed, chemicals, fuels, textiles, and materials for construction, automotive and transportation industries, for furniture and beyond^[10]. As the field and the industry grows^[11] and becomes more consolidated, mushroom and mycelium production and downstream industries will develop further – also creating potential for rural areas in developing countries^[12].