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Co-Emerging **Futures**

A model for reflecting on streams of future change

Reon Brand, Philips Design, 2019

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Contents

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A model for reflecting on streams of future change

Background

In this short paper, I briefly introduce four **Co-Emerging Futures** that are transforming our world. In the near future, I will follow this up with a more comprehensive exploration of these Co-Emerging futures. However, before I present this model, it may be helpful to briefly outline an earlier internal research paper titled ***'Rethinking value in a changing landscape'*** published by Philips Design (Brand & Rocchi, 2010).

In that paper, we presented a model for strategic reflection and business transformation by exploring how value in the modern world was evolving across four distinct socio-economic paradigms, which unfolded in a linear sequence: The Industrial Paradigm (1945->); The Experience Paradigm (1980->); The Knowledge Paradigm (2000->); The Transformation Paradigm (2015->). We explored how the perception, creation and distribution of value has changed over time through the unfolding of these different paradigms.

The **Industrial Paradigm** accelerated in Western economies after the Second World War and leveraged advances in technology and manufacturing. These enabled companies to mass produce goods and enticed large workforces to leave the countryside to work in urban factories, which raised the income of people, modernized their lives and improved their standard of living.

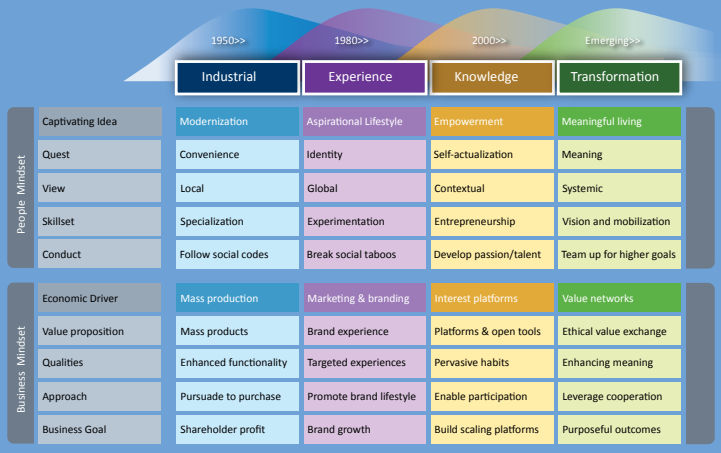
The **Experience Paradigm** emerged in the 1980s as a new wave of value creation to stave off increasing commoditization that was hampering the ability of many industrial companies to generate value. By engendering lifestyle aspirations, experience economy companies were able to create lifestyle brands that filled an identity gap experienced by people living in densely populated cities. Customers paid a premium for products and services offered by lifestyle brands; signifying their aspirational identities by buying into carefully crafted brand narratives and images.

The **Knowledge Paradigm** emerged at the turn of the millennium, when the Internet became interactive and a platform for user collaboration through social networking sites, blogs, wikis, video sharing sites, and hosted services (popularly referred to as Web 2.0). This unleashed a 'democratization of technology' that allowed ordinary people to produce content and collaborate directly with one another, and to obtain tools to experiment and cultivate their own identities. In turn, this shift introduced the concept of a Value Network, in which value creation and consumption no longer followed the classical value chain approach. People could produce and consume value and participate in peer-to-peer value exchange on several key digital platforms.

The **Transformation Paradigm** introduced a new way for companies to create business value by taking joint ownership of key societal and environmental challenges, in particular by creating value-sharing partnerships with other (public or private) stakeholders to address these challenges.

In the nine years since 2010, when we published the paper, we have witnessed how Knowledge Paradigm companies such as Amazon, Facebook and Google have become some of the most valuable companies on the planet. In the same period, an increasing number of companies have also started to experiment and create new business within the Transformation Paradigm (Rocchi, Sarroukh, Subbaraman, De Clerck, & Brand, 2018).

Paradigms of changing economic value



Graph from internal research paper titled 'Rethinking value in a changing landscape' published by Philips Design (Brand & Rocchi, 2010)

Introduction

In our paper 'Rethinking value in a changing landscape' from 2010 (outlined above), we approached the understanding of emerging change from a predominantly socio-economic perspective. The model we produced proved to be very useful in helping companies to think about value creation in different emerging paradigms. It served as a practical framework for strategic reflection on the organizational power structures, organizational language and communication, business models, and types of talent, companies need to succeed in a given paradigm.

This paper not only gives more nuance and direction to the Transformation economy, but also provides a framework for understanding the four key emerging trajectories of co-emerging futures.

The paper has three main purposes: Firstly, it provides a framework for public debate on the future of humanity our relationship with living ecosystems and the planet at large.

Secondly, it provides inspiration and cause for the reflection on innovating and designing for the future. It calls into question existing approaches to Design and Innovation.

Thirdly, it provokes by questioning and challenging the wisdom of a number of implicitly accepted existing global initiatives.

In writing this current paper, I reflected deeply on the nature and meaning of the changes that are happening in the world now; the social, economic and technological drivers behind them; and how we make sense of these changes. As humans, we find ourselves at a precarious moment in the history of our planet. We are witnessing a number of cascading changes that may irrevocably change its complex dynamic system. Such changes include climate change, biodiversity loss, decline in global governance and the development of technologies that may dramatically transform the labor market and the social fabric. The combination of these changes is so impactful that it not only challenges economic growth and social stability, but it may threaten the ecological stability of our planet as a habitat for human and other biological life.

For this study, I thus felt the need to take a fundamentally different approach to that of our previous paper, which focused primarily on socio-economic value creation. Many of the changes in the world at large are rooted in the fact that for the last few decades, humanity's relentless social, technological and economic development has been guided by a utilitarian, anthropocentric and material worldview focused on customer preferences, human aspirations, human needs, and the pursuit of economic growth.

Current economic models adopted across most of the world do not factor in the cost of human material progress to the environment, and despite warning signals from various scientific studies, mainstream discourse has had very limited success in translating this awareness into meaningful and effective socio-economic action. However, newer models are emerging that recognize this limitation and propose a sustainable debt policy to balance economic growth with environmental protection (Gonzalez-Redin, Polhill, Dawson, Hill, & Gordon, 2018), or even set out the pursuit of economic models that are not based on the need for growth (Heinberg, 2011) (Jackson T. , 2009). It remains to be seen how far this thinking can eventually find its way into effective economic policy-making and global governance.

Making sense of future change

Based on this thinking, I also felt the paper should include a view from a predominantly ecological perspective. Such a perspective would stimulate the debate of how we, as people, would view value creation and designing solutions differently if human needs were subordinate to requirements for a healthy and thriving ecosystem. What would happen if industries were to design for the benefit of nature with human needs as a secondary benefit?

Of course, in taking such a view, I realize that not everyone has the same mindset and beliefs. We all make sense of our world in our own way by tapping into root memes (viral ideas) deeply embedded in our sub-consciousness. As the world shifted from modernism to post-modernism, many people, particularly in Western societies, went through a period of accepting multiple truths in the belief that truths are not absolute, but filtered and shaped through personal and cultural experiences.

However, in the last few years, there has been a shift towards large swathes of people becoming less open to persuasion. As consumers and users of information, we are increasingly segmented into channels of confirmation bias by search engine algorithms that understand us and predict our responses better than we understand ourselves. Instead of becoming more open to respectful discourse, our ways of making sense of the world have become increasingly insular, politically corrected through mass social feedback, as our beliefs and worldviews are increasingly influenced and shaped by search engine and social media algorithms, bots and mass propaganda.

This is one of the pitfalls of the pervasiveness and penetration of the knowledge economy and social media into our personal daily lives. Instead of rich global narratives and discourses emerging, we see a funneling of worldviews into a few streams of thought. It is therefore logical that different futures will co-emerge. In order to understand some of the mindsets driving different Co-Emerging Futures, it is perhaps good to re-visit some of the root memes that have been shaping human civilizations for hundreds of years. Many of these memes still persist in different human societies and contribute to shaping and influencing human attitudes and perspectives, and I will refer to some of these in different sections of the paper.

Most futures and foresight models used for making sense of change take evolving socio-cultural values, socio-economic change and/or technological advancement as a starting point for deliberating on probable, possible and preferable future directions. They assume that people can direct and control their own destiny and are capable of shaping a positive future for themselves. However, the damaging impact on the planet's ecosystem brought about by actions to shape the world that we desire is increasingly confronting humanity. It is becoming clear that we may be overestimating our ability to control the destiny of our planet, or even to safeguard it as a sustainable habitat for humans and biological life in general.

Complex dynamic systems (such as our planet, the ecosystem, the seasons, the weather, civilization) can appear to be very robust and immune to disturbances. However, when changes start to accumulate faster than the system can adapt and reach a critical threshold, they can suddenly cascade and create an irreversible critical transition (called hysteresis) and a completely new unpredictable dynamic system can emerge. In emergent complex systems theory, a complex dynamic system has properties not exhibited by any of the underlying parts (Funtowicz & Ravetz, 1994). The reason that dramatic shifts in stable complex systems can happen so seemingly suddenly is that cascading phenomena have inter-independent reciprocal causal relationships. The cascading effect of emergence can shift a geological, ecological and social metasystem into another type of system. It is very difficult to imagine the properties of the system after such

a shift because emergent phenomena do not exhibit linear relationships. One of the defining properties of a complex system is that when cascading changes set off a shift to a different emergent complex system, it is almost impossible for a system to return to its previous state.

As humanity, we are able to observe linear change of individual variables, but we are poorly equipped to sense systemic change. This causes us to underestimate the magnitude and appear blind to emerging non-linear of systemic shifts. There are two reasons for this. Firstly, as humans in modern society, we have a tendency to specialize, which narrows our view. Secondly, many, especially in Western societies, are inclined to use predominantly logical and reductionist thought processes to comprehend change. This makes it very difficult to convince large groups of people of the significance and meaning of higher order systemic changes that transcend individual fields of knowledge. Economists tend to focus on economic and policy change. Environmentalists focus on climate change and ecosystem issues, while business stakeholders often ignore their concerns and recommendations if it means challenging their pre-occupation with 'business and economic growth'. Technologists rely on the promise of technology to fix all ills with more technology, despite the fact that most of these problems arose due to the scaling up of technological applications in the first place. In order to find systemic solutions, humanity needs far more multidisciplinary thinking and holistic awareness and intuition.

It's in this context, that I am now exploring in greater depth how the Transformation Paradigm is evolving against the background of escalating environmental and social challenges. But I am doing so in terms of the widely-used alternative futures approach, originally published about four decades ago (Henchley, 1978), which defines 'possible', 'probable' and 'preferable' futures. In retrospect, the Transformation Paradigm as described in the 2010 paper is an example of a preferable future that is gaining some momentum. The concept of a preferable future introduces the idea that humans not only need to try to predict or anticipate the future as spectators, but also to actively participate in shaping it, by creating a joint vision and mobilizing public, political and business support to realize this vision. This approach inspires a feeling of control and activism, but it has a downside. It is predominantly anthropocentric in nature, putting human needs first. What is most appealing for humans, may not be the best for life on the planet.

Perhaps as humans we need to think of the future not as a utopian end-point, but an evolving complex system. It may be better to reflect on the systems that we are creating in pursuit of our dreams.

The Anthropocene

The start of the Anthropocene

The Anthropocene is the name of the current geological age, which supersedes the Holocene. The Holocene started after the last ice age in the history of the Earth around 12,000 years ago. The Anthropocene derives its name from the observation that humans have started to radically transform the ecosystem and even weather patterns, and have become a force changing the geology of the planet.

The Anthropocene began with the Age of Enlightenment that introduced the philosophy of modernity in Europe in the 18th century. The Enlightenment was an intellectual movement, which developed mainly in France, Britain and Germany, that advocated freedom, democracy and reason as the primary values of society in a break with the dominance of religious thought of the Middle Ages. It brought with it the idea of progress through the pursuit of knowledge (through reason) and it seeded the scientific revolution, bringing scientific thinkers such as Sir Isaac Newton center-stage in shaping the Western approach to science and epistemology for centuries to come. This shift in human philosophy paved the way for waves of rapid technological and industrial development that would transform human life and the planet at large.

The belief in personal freedom was a core element in the ideology of the Enlightenment, and while this liberated people to pursue their own goals and beliefs, it also set humanity on a path of increasing individualism with less consideration of the 'common good'. As these values spread, societies across the world increasingly developed material aspirations and deployed technology and infrastructure that dramatically expanded humanity's footprint on the planet. After the Second World War ended in 1945, industrialization accelerated and mass consumerism emerged to become the basis of the current global socio-economic model.

This wave of material progress, combined with the prioritization of individual liberty over collective interests, has fueled the Anthropocene. It was the basis for building the global, predominantly capitalist, economy, driving for growth. Economic growth is maintained by constantly stimulating consumerism and satisfying every possible real and manufactured need of consumers who are working ever harder to get ahead and increase their standard of living through ownership of more material assets.

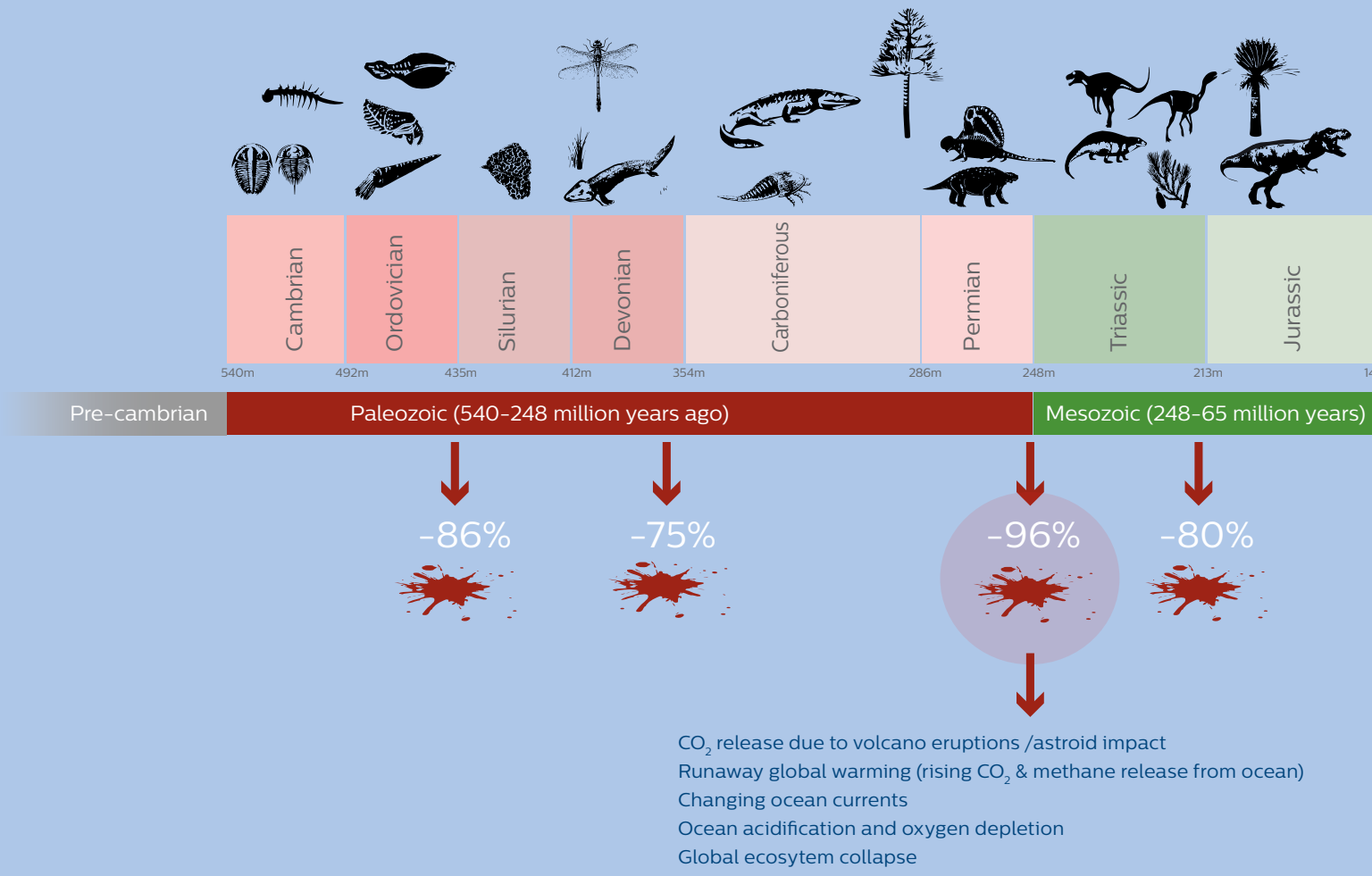
Ecosystem impact

Humanity's impact on Earth's ecosystems began around a million years ago with 'Homo Erectus' (Miller, 2013) and the mastery of fire for warmth and cooking. But the switch from burning biomass towards coal, gas and oil started only in the late 19th century. The age of Enlightenment unleashed the power of science which powered the advances of the Industrial Revolution. In industrial economies, it brought a shift from products crafted by artisan to mass production and consumption of consumer goods, which dramatically expanded human impact on the planet.

Although humans only account for 0.01% of the biomass on earth, our footprint is completely out of proportion with this tiny percentage (Dockrill, 2018). At the turn of the twentieth century, 85% of the planet was wilderness largely untouched by humans. Today, only 23 % of the landmass is considered to be wilderness, and this is rapidly shrinking due to the expanding human technological, economic and domestic footprint (Watson, et al., 2018). Populations of mammals, birds, fish, reptiles, and amphibians have, on average, declined in size by 60% over a period of 44 years from 1970 to 2014. (WWF, 2018)

The exponential increase of CO_2 and other greenhouse gasses such as methane in the atmosphere is a driving force in climate change that may make large parts of the planet unlivable in less than a century. We are already seeing the collapse of ecosystems such as the Great Barrier Reef in Australia. Coral reefs occupy 1% of the ocean, but they provide food and shelter for 25% of all marine species. The combination of ocean warming, acidification due to CO_2 and pervasive pollution is pushing oceanic ecosystems towards collapse. Even if we could halt further CO_2 emissions and stop pollution, it may take thousands of years for an ecosystem like the Great Barrier Reef to recover. By 2050 there will be more plastic in the world's waters than fish. Industrial agriculture amplified our ability to produce food but at an environmental cost of pesticides and chemicals pervading the ecosystem and food chain. In the last three decades, scientists have recorded a 75% decline in flying insect biomass in so-called protected areas (Hallmann, et al., 2018). Scientists now agree that we have entered the 6th major mass extinction (Figure 1) that has been documented on the planet (Ceballos, Ehrlich, & Dirzo, 2017). Species are now disappearing at more than a thousand times the background rate of extinction. The majority of species in the wild face possible extinction in the coming century.

Geological epochs and major extinctions in the history of the planet



In his address on 3 December 2018 at the United Nations (UN) summit on climate change in Poland, Sir David Attenborough, the famous nature documentary maker, said: *"Right now we are facing a man-made disaster of global scale, our greatest threat in thousands of years: climate change. If we don't take action, the collapse of our civilizations and the extinction of much of the natural world is on the horizon."* But motivating people to take uncomfortable measures is never easy. Humans have an endorphin-based pleasure-seeking reward system that makes us psychologically wired towards short-termism (Gilbert, 2006). Today, masses of people across the globe people remain apathetic, in denial, or even blissfully unaware of how the unfolding changes may impact humanity. Many simply remain preoccupied with their own individual needs and aspirations, often at the expense of others, or the planet at large.

A perfect storm – rising climate change and a decline in global governance

The emergence of the Transformation Paradigm described in our earlier paper (Brand & Rocchi, 2010), was reflected in the 17 Sustainable Development Goals (SDGs) adopted by world leaders in September 2015 at an historic UN Summit. The UN sustainable Goal 17: *'Partnerships for the Goals'* is almost exactly as we described the principles of the Transformation Paradigm a few years earlier: *"A successful sustainable development agenda requires partnerships between governments, the private sector and civil society. These inclusive partnerships built upon principles and values, a shared vision, and shared goals that place people and the planet at the center, are needed at the global, regional, national and local level."* The UN also stated addressing the SDGs represents a 12 trillion US dollar economic opportunity for the private sector (Vali, 2017).

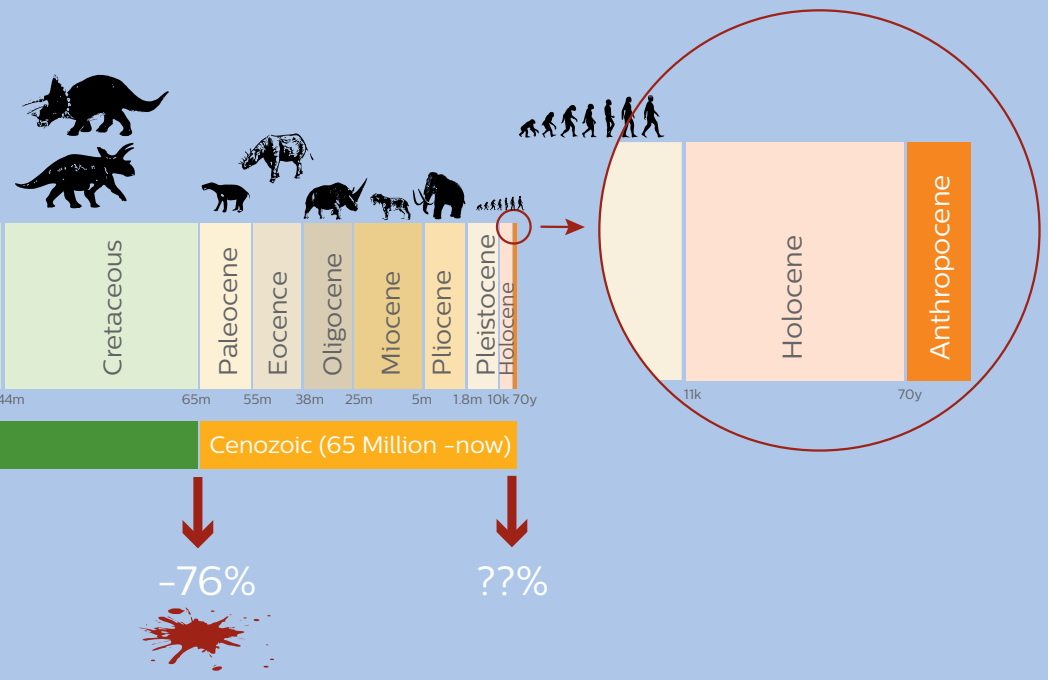


Figure 1: Major recorded extinctions in the history of planet Earth. Diagram copyright: Philips Design

However, as humanity speeds towards an uncertain future in the face of accelerating climate change, it is necessary to reflect and take a critical look at the emerging realities – how is humanity acting to mitigate the effects of a changing planetary ecosystem?

The comprehensive report of the Intergovernmental Panel on Climate Change (IPCC) released in 2018, showed a high likelihood that the world will reach or cross the 1.5 °C threshold of global warming in the period between 2030-2050, which will have a strong impact on warm water corals, fisheries, terrestrial ecosystems and coastal flooding (IPCC, 2018). To avoid exceeding 1.5 °C, the world must slash carbon emissions by 45% by 2030, and completely decarbonize by 2050. This target seems increasingly unrealistic since emissions are still rising due to lack of accountability and coordinated global action.

Moreover, the socio-political environment has dramatically changed in the last few years. The stability of the European Union (EU) is under threat due to continued economic fragility, mass migration and political polarization. In 2019, the UK, a key member will leave the EU following a painful 'divorce' popularly termed 'BREXIT'. Traditionally strong relationships between the US and EU have cooled since Donald Trump became the 45th president of the US in November 2016. President Trump and his administration have effectively dismantled the US Environmental Protection Agency. The shift in the US towards a more nationalistic worldview and economic agenda has weakened and even reversed the process of economic globalization and free trade agreements between key trading partners and has emboldened other populist leaders. The US has now embarked on a dangerous path of ignoring the looming perils of climate change in order to boost economic growth. The US government has lowered environmental enforcement standards, re-invigorated coal production, and it has pulled out of the 2015 Paris agreement – an agreement between all nations to cooperate in the fight against climate change by limiting CO_2 emissions. This shift has emboldened other populists and has fueled the rise of the alt-right around the globe. Jair Bolsonaro, Brazil's president (elected in October 2018), for example, is an ultra-right conservative who is widely expected to favor economic growth over environmental protection of the Amazon rainforest. The decline in global governance could not come at a worse time, and drastically diminishes the prospect of reaching global targets to limit climate change. Effectively humanity is losing the battle (The Economist, 2018). The US has also weakened institutions such as the UN and WHO by dramatically cutting their budget contributions. This means that increased bottom-up cooperation and action will be required if humanity is to climate change.

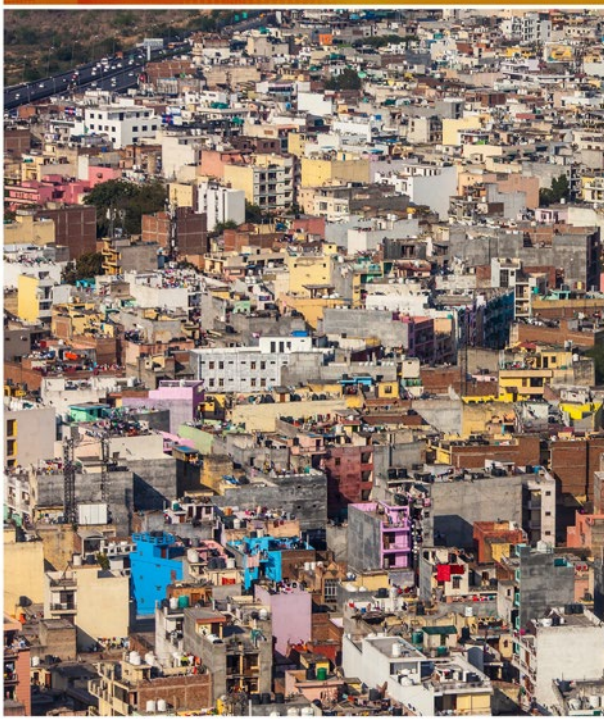


Figure 2: The world is heading for a >2 °C increase in average global temperature by 2055, with potentially catastrophic impact on human civilization and the ecosystem at large. Images courtesy Pixabay and Dreamstime.

Co-Emerging **Futures**

A new model for understanding unfolding change

The new model of Co-Emerging Futures that I introduce in this paper aims to map the key streams of unfolding change that are transforming our world. With the decline of global leadership and governance, diverging worldviews are emerging that are shaping narratives, investments and cooperation into different future directions (Figure 3). As mentioned in the Introduction, the Knowledge Paradigm has brought social media platforms such as Facebook and search engines like Google. These platforms use algorithms which feed information and social commentary to people based on their prevailing worldviews and preferences to ensure these resonant positively with each individual. This confirmation bias creates 'tribes' of like-minded people sharing common worldviews.

As briefly indicated under 'Guiding Philosophies' in Figure 3, most people have root worldviews and a belief system that influence how they will interpret, prioritize or even reject information. Although these sets of philosophies are depicted as a linear succession in the diagram, many of the core memes and beliefs can continue to co-exist over time.

Pre-modern beliefs were often rooted in morals ascribed to higher gods and deities who were controlling the future. Certainly, in Christianity, (and other Abrahamic faiths such as Judaism and Islam), humans were given the 'legitimacy' to rule over nature by God. (Holy Bible, New International Version: Genesis 1:28). Even among non-religious, this meme is very deeply embedded in the human psyche of many societies today, where people view themselves as 'above nature' and believe that it is their right to exploit nature for our benefit.

Modernity is rooted in classical Newtonian science and pursues the ideal of human technological and scientific progress. It started in Europe with the Enlightenment in 18th century which, as I discussed earlier, created a new ideal of individual freedom, equality and progress through science. This socio-economic shift became the foundation for the Industrial Revolution. The modernity mindset believes that through analysis and empirical knowledge, we can understand all aspects of our world, and use technology to control it to our ultimate benefit. This is a material view of the world, convinced that everything

in the universe consists of building blocks, which can be dis-assembled, understood and re-configured to utilitarian human needs. Classical science has predominantly a cause and effect deterministic 'machine view' of the world. Even today the modernity mindset is very strong, and many societies pursue ideals and visions of progress through rational problem solving and technological advances based on objective classical science. It is the backbone of much of the industrial progress in the world.

Post-modernism emerged in the 1960 as a backlash against the big utopian narratives and rational approaches towards epistemology. It took inspiration from Asian philosophical influences such as Buddhism, Yoga, meditation practice and the Chinese concept of Yin-Yang. Asian philosophers have never seen humans as above nature, and do not view the cosmos and the Earth as a deterministic machine that can be understood through rational analysis alone. The Yin-Yang concept recognizes that what seem to be opposites are actually two sides of the same coin and that one cannot exist without the other. It sees the universe as a complex ever-changing, constantly re-balancing, self-regulating system. The post-modern era saw the development of philosophical theories such as Phenomenology, which rejects pure logic and objectivity as the only path towards epistemology, instead incorporating subjective experience, intuition, empathy and other subjective values into sense-making. Another philosophy, Structuralism, incorporates sociological factors such as ethnicity, gender and religion as valid factors in epistemology. Some have argued that this shift from objectivity towards relativism has contributed to today's post-truth society, which is fueled by social media and populism, and where every opinion is deemed as equally valid (Dennett, 2018).

Following post-modernism comes the current post-Post-modern era. In philosophy there is an interesting shift towards Relationalism. Many philosophies in this family such as Object-Oriented Ontology (Harman, 2018) and Agential Realism take inspiration from quantum theory rather than classical Newtonian science. Both Einstein's Theory of Relativity (which introduced the concept of space-time and how it can be warped by gravity) and Quantum Mechanics revealed that while Newtonian science is useful for the development of practical technologies, it is not universally valid and cannot explain the underlying connected nature of reality on a cosmic or quantum level. Classical science tries to logically break down everything into building blocks in order to increase understanding. But Relativity and Quantum Mechanics show that to understand the nature of the physical universe, we have to examine things and phenomena in the context of relationships. Indeed, quantum mechanical experiments have demonstrated that even sub-atomic phenomena can be entangled over long distances. Similarly, Relationalism holds the view that the nature of reality is not in building blocks themselves, but in the dynamic relationships that they have with one another where is everything connected. Relationalism also resonates with environmentalists who believe we can only understand nature by taking a holistic view and understanding the complexity of relationships (Lovelock J. , 1995).

These mindsets and ideals lie behind the different trajectories in the Co-Emerging Futures model depicted in Figure 3. In our earlier paper, the 'Knowledge paradigm' is succeeded by the 'Transformation Paradigm' (Brand & Rocchi, 2010), As the new revised model shows, the Knowledge paradigm is now succeeded by two distinct trajectories: The 'Trans-mutation' direction, which is pursued by people with an augmentative mindset, and the 'Transformation' direction, pursued by those with a preventative mindset. Each of these two directions undergo a further split to yield four Co-Emerging Futures (Figure 3).

In other words, the 'Knowledge Paradigm' will give way to four distinct co-emerging future trajectories. Each of these future directions, will resonate with groups of people with very different belief systems and worldviews, who process and interpret the same events very differently and may aspire to completely different goals and means. However, I want to emphasize that the four futures are not scenarios, but are co-emerging futures driven by these different mindsets, beliefs and interests.

Guiding philosophies

Pre-modernism

(Western) belief that deities and spirits determine the future and hereafter

Modernism

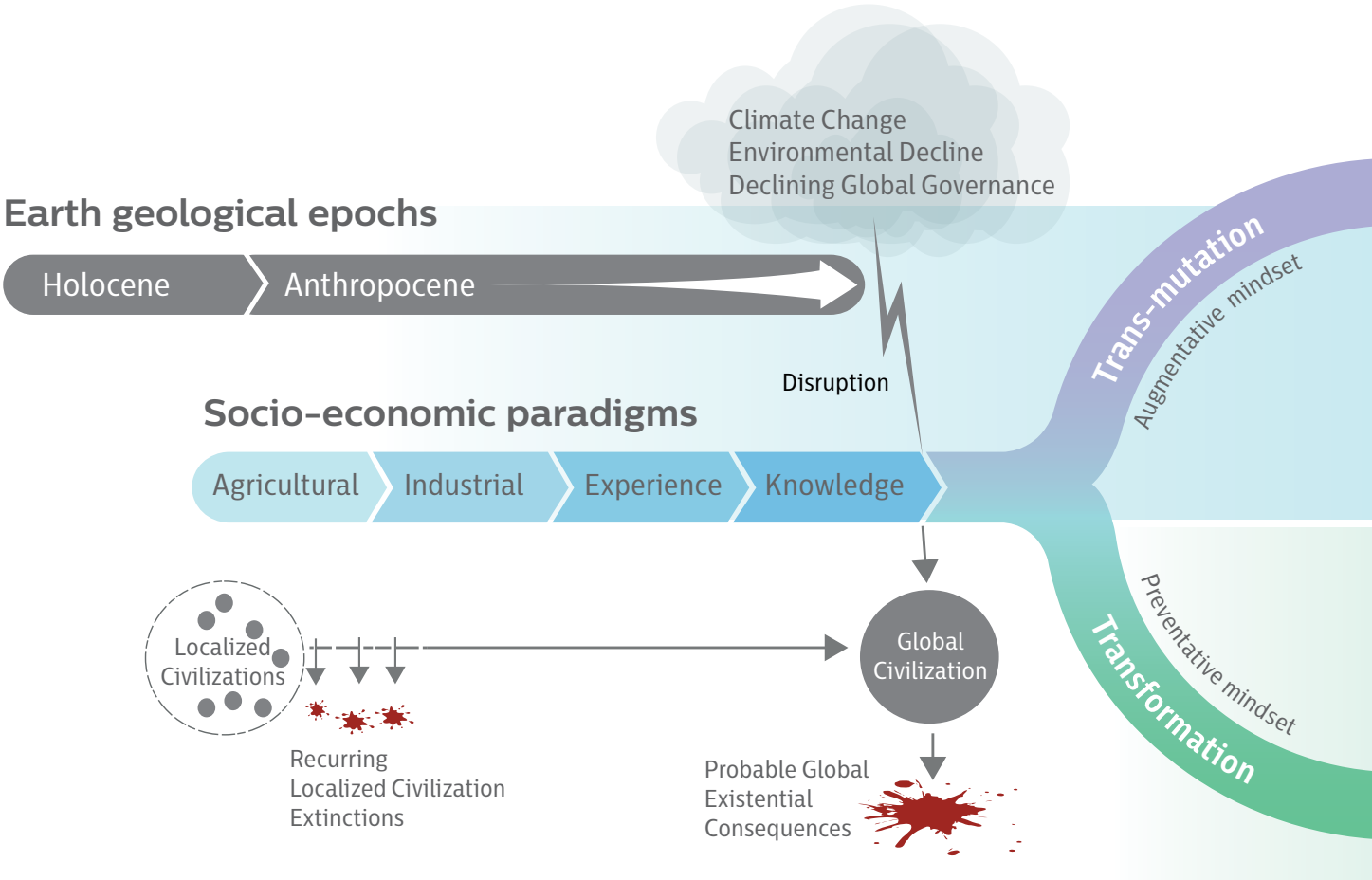
Deterministic utopian visions driven by technological progress

Post-modernism

Relativism and the acceptance of multiple truths - constant try-out and experimentation

Relationalism

Being thoughtful, and increase awareness, knowledge and intuition about the relationships of all phenomena in complex open dynamic systems



Chronological Timeline

past — now — future

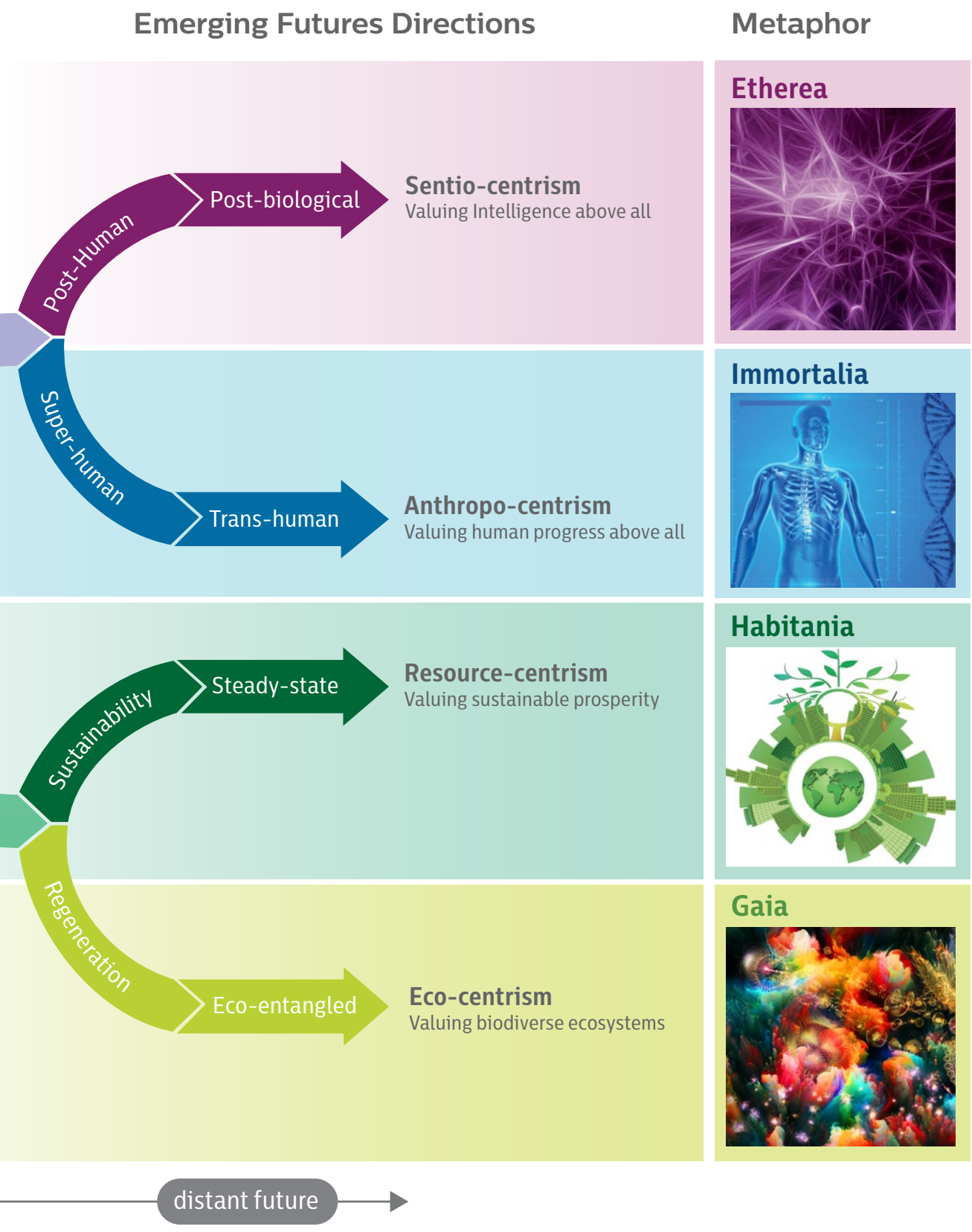


Figure 3: Co-Emerging Futures. A model for understanding emerging global change. Created by Reon Brand. Copyright: Philips Design

The path of Trans-mutation
an augmentative mindset

The future trajectory which I call **'Trans-mutation'** is based on an augmentative mindset. In this view, humans aspire to shape their own evolution and augment themselves and their man-made environment according to their own needs. It is based on a deep-seated belief in the needs and ethics of human progress; a belief in the power of science and technology, and that humans have a fundamental right to exploit nature for their own benefit and progress. The view does not consider the current state of humanity and/or Homo Sapiens as the pinnacle of Darwinian evolution on the planet. There is a belief that Homo Sapiens is differentiated from 'lower' species by its consciousness and intellect and its ability to shape its own future and ultimately its own evolution. Indeed, this Trans-mutation stream incorporates a deep belief that humans can overcome the challenges of their environment through technology and that at least part of humanity will continue to evolve to 'Human+' or 'Homo Deus', where humans become their own creators, re-shaping themselves and their environment. This theme has been explored in some depth in recent literature (Harari Y. N., 2016). The Trans-mutation trajectory divides into two directions **'Immortalia'** (Super-human ➔ Trans-human) and **'Etherea'** (Post-human ➔ Post biological).

Immortalia

Figure 4: 'Immortalia' is the metaphor of the Co-Emerging Futures direction towards 'Super-human' and 'Trans-humanism'. Illustrative image courtesy of Pixabay.

Image: Pixabay

The metaphor of Immortalia

The metaphor of **Immortalia** captures humankind's obsession with achieving longevity and eventually immortality. The myths of immortality recur throughout the consciousness of human existence across many cultures and ages. How and why did we as mortal beings become so interested in pursuing the ideal of immortality? Even though the ideal can be traced back to some of the earliest texts known to human civilization, the immortality meme is still very much embedded in modern culture. One of the earliest known substantial works of literature, the 'Epic of Gilgamesh' from Mesopotamia (2100 BC.), focuses on the quest of the protagonist, Gilgamesh, for immortality (The Editors of Encyclopaedia Britannica, 2009). Later, across a number of cultures, alchemists started to search for the elixir of life in order to bestow immortality on human beings.

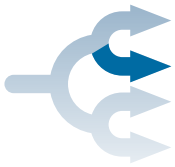
Many religions such as Christianity, Islam and Hinduism have developed different narratives based on eternity and the immortality of the soul. The concept of the separation of body and soul (or mind) started with the Greek philosopher Plato about 4th to 5th century BC. Plato referred to the body as a prison of the mind (Plato - Translated and Edited by Gallop, 2009). The body was seen as temporal, whereas it was believed that the human soul is immortal. In the 17th Century, mathematician and scientist, René Descartes (1596-1650) laid the foundations for dualism and Enlightenment philosophy, making the famous statement "I think, therefore I am". He established the dualistic philosophy of mind that mental phenomena are non-physical, or that the mind and body are distinct and separable, and influenced generations of scientists and philosophers after him with Cartesian thinking in terms of mind and body, subject and object. More recently, with the advances of rational Western science and technology and a decline in belief of the afterlife of the immortal soul as the basis of human immortality, people have started to put faith in science to achieve longevity and immortality. In many technologically advanced societies, the exponential rise of material scientific discovery and technological possibility have fueled a shift towards increased secularism and atheism. This has translated the search for immortality into a technological quest, free from spiritual paths or religious belief.

The Immortalia ideal

The emerging future path towards **Immortalia** seeks to augment human capabilities with technology to become 'Super-human'. Eventually humans will be 'upgraded' to 'Trans-human', (e.g. through genetic modification of the human germline) into a higher species than Homo Sapiens. Trans-humanism is based on a strongly anthropocentric and material worldview that puts human ingenuity and progress above all (Figure 3). Through rapidly advancing technologies such as sensors, implants, gene therapy, and gene editing, those who can afford it will be able to vastly transcend the capabilities of ordinary (non-augmented) human beings. Technological advances which may become building blocks for the path towards trans-humanism are already dominating news headlines today. as part of the recently coined 'Fourth Industrial Revolution' (Schwab, 2016) – a revolution that will be driven by a convergence of key technology streams such as molecular biology, nanotechnology, quantum computing, artificial intelligence (AI) and robotics. By taking control of human evolution on a molecular level, supporters of this future envision dramatically prolonging longevity by halting or even reversing biological aging to retain vitality and beauty and to enhance human cognitive abilities. Trans-humanism is rooted in technological optimism and a belief that through advanced technology, humans will not only be able to enhance themselves as humans and dramatically prolong their lifespan, but also create technology-enabled smart cities resilient to natural processes or climate change.

Immortalia mindset and beliefs

Immortalia is solidly rooted in Modernist thinking and philosophy (Figure 3 – Guiding Philosophies). Although diagrammatically, it seems that the succession of philosophies replace one another, in reality they tend to co-exist and many of the memes from each of the philosophical era are carried forward to others. As already discussed, Modernist thinking is rooted in a material, classical Newtonian ideal of science and in the Enlightenment ideal of progress and individual freedom, which is the basis for the techno-optimism that makes many believe that humans can use technology to create the future they want.



This techno-optimism developed into a belief and a movement that believes technology will help to fulfill the age-old quest for immortality. The Extropian philosophy launched by Max More in 1988, has become the foundation for Trans-humanism (Figure 3). It is a framework of values and standards for continuously improving the human condition and longevity through technology (More & Vita-More, 2013). Today, Trans-humanism is a growing movement that is becoming mainstream, as indicated by a recent article in Forbes magazine (Singh, 2017). The movement has attracted well-known future thinkers such as Ray Kurtzweil (now employed by Google), biologists, robotics experts, neuro-engineers and even politicians (O'Malley, 2017). It is based on an almost evangelical belief that advances in science and technology will enable people to live indefinitely in the near future. Although the movement was primarily driven by male academics and technologists in its first years, the Singularity Web (which is one of the most important social media platforms for this group), has shown that the ideal is now attracting a broad cross-section of followers across gender, ethnicity, profession, political and religious persuasion, and is growing rapidly (Istvan Z. , 2014).
The movement encourages its members to experiment and participate in enabling a Trans-humanist future. It is very much rooted in the monist material philosophy that sees the mind as part of the material body, and which can therefore be manipulated and improved based on material technological intervention from the four key streams of emerging technologies: nanotechnology, biotechnology, information-technology and cognitive-neuroscience (Roco & Bainbridge, 2003).

Immortalia drivers

Many people stand in awe of the technological achievements of humanity, especially those of the last century. Humanity's many technological achievements have delivered symbolic moments in history that continue to inspire the unshakable belief in technology amongst techno-optimists. One such moment was 20 July 1969, when Neil Armstrong took the first steps on the moon. The Apollo moon shots cemented the belief that anything is possible through technology and progress. They exemplified the acceleration of industrialization after the Second World War, driven by the Cold War between the West and the (then) USSR, as well as a new optimism about rebuilding the world through technology and progress.

Moreover, while trans-humanism is inspired by a belief in technology's ability to increase human longevity, it also enshrines a desire to improve and vastly extend and exceed current human capabilities in order to be more competitive and successful.

This desire is partly a response to the pressures of living in modern societies. Today, life in almost every successful corporation is a life of urgency, speed, adapting to constant change, and facing the daily threat of potentially faster and more ingenious competitors which can render your company obsolete.

As a result, companies are constantly developing and implementing faster and more efficient processes and tools to increase profits and stay competitive. Employees are under increasing pressure to perform better, to stay healthy, and to be and appear resilient. They are increasingly scrutinized and monitored by companies for performance, and technologies are playing an increasing role in their lives to take care of their needs.

Today, for many of us, apps and devices monitor what we eat; how much we exercise; help us to perform self-diagnosis; monitor our sleep patterns; manage our schedule; provide us with fashion advice; and monitor, track and manage our online visibility on social media. People not leveraging these technologies are running the risk of losing their competitive edge, losing their income and rapidly becoming obsolete, leading to a plunge in their social and material worth.

This has led to a 'Western lifestyle' of high anxiety, poor diets of highly processed food, constant pressure, sleep deprivation and a rise in depression and other lifestyle diseases. Even with all the advances in science, life expectancy has recently started to drop in a number of Western nations, and most dramatically in the US (Guinness & Kalra, 2018). In contrast to the other higher income countries, declines in life expectancy in the US were because more people were dying in their 20s and 30s. The percentage of people in the US that do not have access to affordable healthcare is far higher than in other Western countries. A high percentage of people in the US rely on self-medication and cannot afford the cost of serious illness.
At the same time, the world is entering the Fourth Industrial Revolution (Schwab, 2016), characterized by a wave of interdisciplinary fusion between the physical, digital

and biological worlds. It offers immense technological possibilities, where AI and big data analytics will be fed by vast amounts of data from a connected world where everything and everybody are constantly connected. Beyond the automation that AI and robotics will bring, AI will transform processes such as design, engineering, pharmaceutical progress, biotechnology and genetic engineering, bionics, quantum science, and the quest for nanotechnology to venture beyond smart materials into creating 'living' self-assembling and self-generative molecular machines.

It is indeed a bold new world that is unfolding around us. Arguably, the smartphone is a tool that has enabled the first steps towards trans-humanism, but many of the most promising future technologies may only be affordable to a wealthy few. Nonetheless, proponents of the ideal see enormous potential. One such is prominent trans-humanist is Dr. Aubrey de Grey, a biomedical gerontologist, who is also the chief science officer of the SENS research foundation. Dr de Grey has become an international celebrity and a key spokesman of the Trans-humanist movement, with roles as an international adjunct professor at the Moscow Institute of Physics and Technology, and as a fellow of the Gerontological Society of America, the American Aging Association, and the Institute for Ethics and Emerging Technologies. In July 2017 he was appointed Vice President of New Technology Discovery at AgeX Therapeutics, a startup in the Longevity space. His focus is on halting aging in humans through advances in regenerative medicine: new possibilities in stem cell research combined with gene therapy to cancel the effect of molecular and cellular process of senescence, which causes aging.

Other new technologies such as CRISPR (clustered regularly interspaced short palindromic repeats) also pave the way for advances in trans-humanism. In particular, CRISPR enables precise gene editing opening up new areas for using gene therapy to treat disease. It also has the potential for germline gene editing, which means that changes will be passed to the next generations and change the human genetic code forever. Although this is a topic of fierce ethical debate, it is probably only a matter of time before it will be used to 'improve' the human genome. Such improvements can include gene editing to extend life, enhance intelligence and memory, and enhance beauty. The technology already exists where AI machine learning has been trained to make surprisingly good predictions of the face of a person based on a DNA sample. This technique is rapidly advancing (Curtis & Hereward, 2018). Such advances could in the future potentially be used for DNA biometrics, surveillance and ultimately to guide gene editing towards a different aesthetic of beauty preferred by parents for their child.

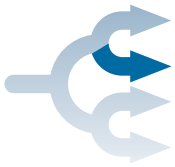
Another area of far-reaching progress is using machine learning to process brain signals. Cognitive computing has advanced to a level where it can enable people to control devices such as robots, prosthetics and interfaces with their mind. New techniques such as optogenetic recording, carbon nanotube electrode arrays (CNTs), injectable mesh arrays of nano-electrodes can enable machines to listen to and stimulate vast arrays of neuron populations simultaneously (Bareket-keren & Hanein, 2013). Such techniques are useful for the treatment of a wide range of conditions such as deafness, Parkinson's disease and chronic pain, to name just a few. CNTs have enormous potential in the development of neuronal interfaces and further study will enable the utilization for other applications such as the quest to directly link AI interfaces to brain circuits. This is currently one of the main fields of research of Neuralink, a company which was founded by Elon Musk to develop ultra-high bandwidth brain-machine interfaces to connect humans and computers (Neuralink, 2018). This will enable humans to seamlessly access the knowledge and processing power of AI and machine-learning to enhance their own intelligence, skills and capabilities and to potentially speed up the learning process. An international collaboration led by researchers at UC Berkeley and the US Institute for Molecular Manufacturing predicts that exponential progress in nanotechnology, nanomedicine, AI, and computation will lead this century to the development of a 'Human Brain/Cloud Interface' (B/CI), that connects neurons and synapses in the brain to vast cloud-computing networks in real time (Neuroscience News , 2019).

These are just a few examples of highly promising technologies that may transform human capabilities and longevity in the future.

Immortalia challenges

Few of the proponents of trans-humanist advances seem to deeply reflect on the type of society and the impact on the world that these advances may create.

With the advances of AI and automation, there are many estimates that predict that up to 50% of jobs may become obsolete in the coming decades. This dramatically reduces the number of people who can benefit from expensive new technologies. Several authors have argued that the advances described here under **Immortalia** will lead to much greater inequality, and even create a 'super human race' (Human+) that will live longer, stay healthier due to improved genetics and better treatments, and have access to technologies that will augment their abilities. They will have superior intelligence, speed of learning, and the ability to accumulate more wealth and control more assets (Harari Y. N., 2016).



Today, this inequality in access to technological progress and accrual of personal wealth is already very visible. As a result, the issue of 'privilege' is becoming more of a discussion point in social media. Several studies have shown that those who are wealthy and privileged tend to be less empathic than poor people, because they believe that they earned their wealth and success, and are entitled to enjoy it (Grewal, 2012). A recent study (based on interviews of 1200 wealthy respondents) shows that the majority of wealthy people are driven by progress and success, and see greed, the drive to success and acquire wealth, and even selfishness as a virtue. (Elkins, 2015).

Immortalia is thus a continuation of the technologies and individualistic mindsets that shaped the Anthropocene, but the inequalities are set to grow and become far more pronounced in the future. There will be a market for expensive life-enhancing technologies available to just a few. For example, so far, only one gene therapy has been approved in the United States—Luxturna, a treatment for inherited retinal disease. Such a treatment costs 850,000 US dollars. But many more gene therapies are in the pipeline for approval with potentially significant economic impact. According to the research agency EvaluatePharma, the US healthcare system could see an influx of such therapies in the coming years, with combined sales forecasts of 16 billion US dollars (Davio, 2018).

The question remains if these new technologies will help to improve global access to healthcare. In the last two decades, healthcare systems and advances in technology in industrialized countries have improved access to healthcare, but the gap between countries with the worst and the best healthcare has been widening. Access to healthcare in highly populated poorer countries and regions such as Africa, India and Indonesia have worsened since 1990 (Cunningham, 2017).

Nonetheless, the shift towards regenerative medicine will transform the healthcare industry in wealthy countries. Regeneration of lost or injured tissues is very common in biology. Salamanders can regenerate just about any of their body parts, including arms, legs, tail, spinal cord, eyes, and in some specimens half the brain. Humans, along with other mammals, can regenerate lost limb buds as embryos. However, they lose the ability, perhaps through silencing of some mechanism, when they mature. Now, with the salamander genome recently sequenced, researchers hope to use it to transfer mechanisms for organ regeneration to humans through gene therapy in the future (Preston, 2018).

Similarly, humans lack the ability to adequately regenerate the heart and many other organs that are commonly affected by modern diseases. But a revolution in stem cell biology has led to a dramatic shift towards developing therapies that can awaken the regeneration potential in patients (Lee & Walsh, 2016). Advances in cancer immunotherapy, stem cell therapy and gene therapy may drastically reduce the need for complicated surgery in the future. These therapies will be based on highly personalized modification of an individual's own cells or genetics, and will significantly augment the ability of the body or damaged tissue to heal itself. The promise of regenerative medicine is based on revolutionary advances in cell biology and how cells can be stimulated and manipulated to repair themselves. In the longer term, even cardio patients may be treated without the need for surgery.

The last challenge to think about in **Immortalia** is the environmental impact of wealthy human societies with a much longer lifespan, possibly combined with an individualistic outlook and sense of material entitlement. Many wealthy individuals have a mindset and belief that they can access technology and resources that will somehow shield them from the adverse threat of environmental decline (Balkissoon, 2018). Such a sense of continued material entitlement will not only speed up the demise of the planetary ecosystems, but also breed societal resentment and conflict.

To think that wealth offers a form of protection against environmental decline, is foolish thinking, because the collapse of ecosystems will threaten all life on earth. Theoretically the wealthy may be able to survive longer, since they have better access to technology and resources that can aid their survival. However, an ecosystem collapse is likely to be followed (or preceded) by a collapse in human governance and civilizations, which will erase any illusion of protection that wealth may offer.

Etherea

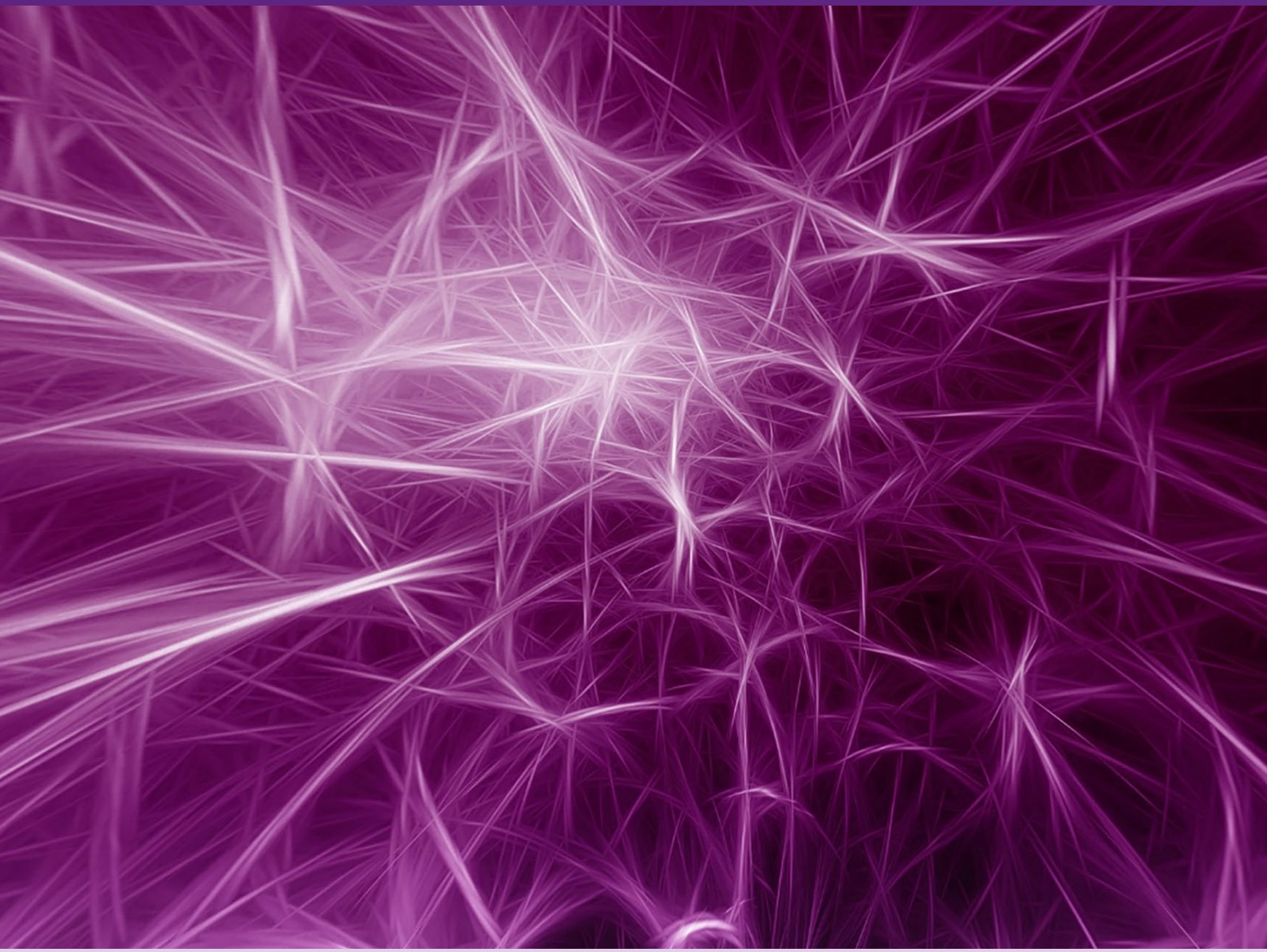
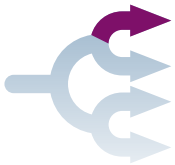


Figure 5: Etherea' is the metaphor of the sentio-centric Co-Emerging Futures direction towards 'Post-human' and 'Post-biological' existence.

Image: Pixabay



The metaphor of Etherea

The metaphor of **Etherea** is also rooted in the body-mind dualism that was first popularized by Plato. Plato and the ancient Greek philosophers placed a much higher value on logic, reason, intellect and therefore the mind, than on the body. In the Platonic view, the body was made of decaying matter, whereas the mind was permanent and ethereal. The Co-Emerging Future path towards the future of **Etherea** is based on a sentio-centric worldview where the advancement of sentience and power of the mind is valued above everything. **Etherea** strives to secure a future existence where human minds will live on and evolve forever, without the need of a biological body or a biological medium.

The Etherea Ideal

The **Etherea** ideal of post-humanism seems similar to trans-humanism, but there is a difference. In **Etherea**, biology and biological matter are seen as an obstacle to human sentient development. There is a growing body of post-human thinkers who believe in a post-biological future for humans. One of the most notable post-biological thinkers is Zoltan Istvan Gyurko. He is a well-known American futurist and regularly publishes articles in Wired, The Huffington Post, TechCrunch and Newsweek. He recently shared his views on the environment and on post-humanism. He believes that biology, nature and the environment are out-dated media for the development needs of human beings, and that as biological beings we will not be able to develop fast enough to keep up with AI. **Etherea** aims to achieve the technological transcendence of humans by abandoning our biological existence. In essence, post-humanists seek to pursue a future where the human mind is uploaded into an intelligent machine. Such a machine may not physically have the body of a human, but the experience of having a body can probably be simulated through virtual reality. By merging the human mind with the vast potential of exponentially expanding AI, the virtual human will have access to unlimited sentient development potential and knowledge which will make a biological human being an obsolete, antiquated entity. The virtual human will become intellectually a far superior and more powerful being. Being freed from the demands and limitations of the biological state, theoretically these new virtual beings will have unlimited freedom to move, socialize and interact.

Etherea mindset and beliefs

Post-biologists share the Platonic disdain for nature and biology. Unlike environmentalists, they do not see nature and the environment as save-worthy (Istvan, 2019). They see the environment as a cruel world where species eat one another and constantly fight for survival. Consequently, they believe that the time has come to abandon the fight for the environment and replace it with the pursuit of a nobler technology-based intelligence. Post-biologists value humans far more than any other species because they believe that human consciousness and sentience make us unique. They believe the shift towards a technological medium of existence will offer us an escape from mortality, but also from suffering and the ecological plight of the planet.

Etherea drivers

I will focus on the key logical, ethical and emotional drivers that attract followers and investors to **Etherea**. One of the key drivers fueling the **Etherea** post-human movement is the rapid rise of AI and the anticipated singularity (Kurtzweil, 2006), where AI will start to exceed human intelligence and will become responsible for its own evolution. At this point the evolution of intelligence is expected to advance exponentially, and there will be a 'new master race' of 'spiritual machines' that will rule the planet and beyond, necessitating the need for human intelligence to merge with AI for survival. Indeed, many post-biology adherents reject the primitive idea of the inevitability of death. The drive for immortality and the possibility of distributed backups of each is a strong motivation.

Adherents of **Etherea** believe that exploration and the advancement of sentience is the highest goal. This is a strong driver in shifting sentience to a non-biological format. Possibilities for scientific and space exploration will open up as it is easier to transport a quantum software program for thousands of years into space than a complex biological organism such as a human being.

As humans we have to accept the finitude of our biological lifespan as well as the finite resources of our planet. In **Etherea**, humans will move from a resource-scarce existence on a finite planet to a life of infinite resources and expansion. In Platonic thinking, the body was always seen as something limiting the mind, and biology was seen as a constant

struggle for survival against disease. There is therefore very little ethical struggle in the post-biological quest to abandon the biological format. Biological beings have to accept the flaws in their own genome, whereas a post-biological being can be constantly self-correcting, developing and improving itself. Immortal and infinite intelligence are the closest humans can come to the gods that they have imagined. We will be our own gods and our own creators, driving our own intelligence and sentient development.

Etherea challenges

The idealistic aspirations fueling **Etherea** raise many questions.

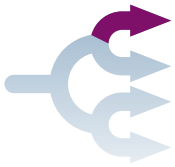
Will AI really achieve and surpass human-level general intelligence in the short term, or is the theory of singularity a pipe-dream? We know that AI, through machine learning, is better than humans at certain tasks, but how close is it to becoming an independent 'life form' that is more sentient and intelligent than human beings? At the 2018 AI Frontiers conference, Ilya Sutskever, Co-Founder & Director at OpenAI (the AI company co-founded by Elon Musk) presented their key findings and predictions (Sutskever, 2018). OpenAI is not focusing on AI, but on AGI (Artificial General Intelligence). AGI is light years more advanced than AI and deep learning used to solved specific problems. To achieve full AGI, an intelligent system needs to learn unsupervised like a human being and develop its own goals for self-development. It will set its own priorities. DeepMind's program AlphaZero already shows evidence of human-like intuition, curiosity and creativity, which is a turning point in the history of AI. At the current rate of progress, it is estimated that full AGI may be achieved in a decade or less.

Merging the reasoning capacity, thought, and memory of a human brain with an intelligence that is vastly superior is like throwing a drop into the ocean. What becomes of our human identity in such an ocean of intelligence? Will we be assimilated in a hive-mind where all intelligence is connected, or will we retain a sense of self? A possible model for the retention of self could be a 'Markov blankets' approach to the development of AI (Kirchhoff, Parr, Palacios, Friston, & Kiverstein, 2018). The concept of a Markov blanket is that there is a boundary that sets something apart from that what it is not, rendering an internal and an external state. Internal states can influence each other but are functionally and structurally independent. In this way, multiple layers of Markov blankets can generate an autopoetic emergent system, much like we see with complex biological life and biological systems today. (Autopoiesis refers to a system capable of reproducing and maintaining itself). In this model each 'Markov-blanketed layer' is a fully emergent autopoetic system that is part of a bigger autopoetic system – it is like a human cell inside a human body, which is part of a human community, and contained in a larger ecosystem. However, such a model again sets us up for the possibility of containment and privatization of knowledge and experiences, conflict of interest and eventually open conflict.

The issue of embodiment raises another question. How can a life without a body be meaningful and rewarding? Much of human brain learning development relies on sensing and processing of input from our bodies. Embodiment is therefore an essential part of learning. Perhaps a digital intelligence may enable us more freedom by allowing us to occupy multiple machines (robots, etc.) to achieve a flexible, constantly morphing form of embodiment. Or will it be a virtual embodiment that can also change at will – something that might be thought of as a form of digital re-incarnation.

Whatever the answer, realizing this vision depends on the assumption that the brain and consciousness form a biological computational machine that can be simulated by a computer. However, there is no proof that the brain functions like the software/hardware model that defines the modern digital computing system.

Perhaps the greatest challenge is the transfer of consciousness - not as a representation or a copy, but as a model that is fully synchronous with the human consciousness to create a shared sense of being (ontological entanglement). Eventually there may be a transfer of agency (where the biological form is abandoned or dies off). The reason that the transfer or upload of consciousness is probably the most challenging problem, is because no one knows for sure what consciousness is or how it is created. There are no theories that explain how consciousness is generated by material processes, or any proof that it is located in, or created by, the brain as is widely assumed in Western culture. Most Western theories are firmly rooted in classical materialism; none of them have come up with any material evidence for the phenomenon of consciousness. One recent theory in Western material science believes that consciousness may be an accidental by-product of entropy that fools the brain to experience consciousness.



There is anecdotal evidence and reports that in altered states of consciousness, human consciousness can reach far beyond the boundaries of the body or ego – termed 'non-local consciousness'. In non-Western cultures there are many accounts of trans-personal experiences of consciousness, where consciousness can tap into the consciousness of other people or even other species. Similarly, there are numerous reports, also in the West, of out-of-body experiences, especially when people are in near-death situations. Indeed, there is a lot of evidence that biochemical processes in the body can alter states of consciousness, which correlates with the non-locality theory of consciousness.

Some leading-edge thinkers propose that it is not the universe that created consciousness, but consciousness that creates the universe. Everything we see and experience is a simulation and an illusion that is created by our brains. Consciousness is most probably happening on a quantum level - there are no soft and hard objects in the cosmos but just connected strings of entangled energy fields; consciousness may be pervasive in the universe on a quantum level, and our bodies may simply be a conduit for consciousness (like a radio that receives signals and amplifies it). There are physicists who are starting to believe that the entire universe is inhabited by consciousness (a phenomenon termed panpsychism). This is interestingly very close to Buddhism – a belief that consciousness is the only thing that truly exists. Panpsychism, the idea of universal consciousness, is a prominent thought in some branches of ancient Greek philosophy and paganism as well as in Buddhism. However, it has been largely dismissed by modern science — until recently. The neuroscientist, Christof Koch, of the Allen Institute of Brain Science in Seattle (which was founded by Paul Allen, co-founder of Microsoft), and physicist Gregory Matloff, of the New York City College of Technology, now believe they may have some evidence that supports the panpsychism theory of consciousness. They believe that any system that has sufficient complexity and energy could generate or 'broadcast' consciousness.

If the idea of consciousness upload sounds like far-off science fiction, there is some remarkable progress in this field. Pioneering experiments wiring together the brains of different animals, demonstrated the ability of brain-to-brain transfer of learning. These imply that some level of memory can fluidly be transmitted and 'broadcasted' (Jiang, et al., 2018). Meanwhile, Dr Randall Koene, perhaps one of the world's foremost neuroscientists, has made other advances in this field. He was interviewed by Singularity Weblog (Socrates, 2011) and shared some of the progress of his work in whole brain emulation. A Director of Analysis at Halcyon Molecular, co-founder of Carbon Copies and co-founder and Director at the Neural Engineering Corporation of Massachusetts, Dr Koene began work on mind-upload research in 1994. His research objective is whole brain emulation, creating large-scale high-resolution representations and emulations of activity in neuronal circuitry that are needed in patient-specific neuro-prostheses. His team has a roadmap towards creating a substrate-independent mind, which will be an emulated brain running in a computer, based on a real mind. This will allow Dr. Koene and his team to interact with such a mind. In other words, they are nearing the stage where they can interact with a recorded emulation of a brain. It thus seems that brain uploads are already in the process of becoming a reality.

Prof. Giulio Tonini, a leading neuroscientist from the Wisconsin Center of Sleep and Consciousness at the University of Wisconsin, also believes the theory of panpsychism may offer the best route to explain consciousness. He has formulated the Integrated Information Theory (ITT), which states that consciousness appears in physical systems that contain many different and highly interconnected pieces of information (Tonini, Boly, Massimini, & Koch, 2016). Currently, he is working on a method to quantify consciousness (a unit called psi) (Massimini & Tononi, 2018) that will help to measure and explain different levels of consciousness existing in the universe.

At this point, **Etherea** is an emerging future with much interesting scientific exploration and investment driving it forward with remarkable speed and progress, but there are still far more questions than answers. **Etherea** will bring a completely new set of issues not found in the biological world. To take just one, in a digital format, multiple copies of you may become a reality. What legal, practical and ethical issues could arise from that?

The path of Transformation
a preventative mindset

People with a preventative mindset are convinced that through coordinated human action, cooperation and systemic change, humans can prevent the apocalypse of climate change and ecosystem collapse – this is the route of 'Transformation' (Figure 3). This trajectory requires a transformation of how we live, consume and produce. Given the perilous state of our natural ecosystems and the growing threat of global climate change, the transformative mindset will look for ways to harmonize humanity's relationship with the environment to ensure a healthy planet. However, not all who are concerned with the plight of the planet share a common view on how to address these challenges.

The transformation trajectory splits again into two main streams: a stream towards **'Habitania'** which aims to pursue sustainability to create a steady state where human non-renewable resource utilization does not exceed agreed limits, and another to **'Gaia'** which sees all life and the planet as a single eco-entangled system and is pursuing a future of regenerating vibrant and healthy ecosystems.

Habitania

Figure 6: Habitania' is the metaphor of the utilitarian Co-Emerging Futures direction towards 'sustainability' and 'steady-state' socio-economic systems. Illustrative image courtesy of Pixabay.

Image: Pixabay

The metaphor of Habitania

The metaphor of **Habitania** captures the quest for creating sustainable prosperity for humanity and a habitat that ensures a good standard of living, whilst safeguarding nature. While it clearly puts human needs and aspirations first, it recognizes limits of non-renewable resources and it endeavors to find a balance between human standards of living and the need to maintain a healthy planet (Figure 3).

The Habitania ideal

The future ideal of **Habitania** is to arrive at a steady-state economy that recognizes planetary limits for the use of non-renewable resources. It assumes that societies can politically, economically and socially cooperate to limit the impact of human production and consumption on the environment and to create safe spaces where nature is managed to maintain biodiversity. As a philosophy, it is rooted in the Newtonian view that the Earth is a deterministic system of inputs and outputs, causes and effects that we as humans can control, modify and optimize to achieve a desired outcome. In this belief, we can develop processes and governance to balance the need for resources and economic prosperity with the need to maintain a healthy planet. The effort to reduce the environmental impact of the Anthropocene through responsible consumption and production relies on an integrated strategy that includes new 'clean' technologies, frugal design, recycling-driven consumption (e.g. Circular Economy) and conscious, better educated consumers, along with effective environmental laws that are fully enforced.

Habitania mindset and beliefs

Ultimately, **Habitania** is rooted in an anthropocentric utilitarian mindset and in a belief that we can implement solutions to manage scarce natural resources in a sustainable way to the benefit of all humanity through a combination of legislation that recognizes planetary limits and harnessing scientific progress.

It sees humans as acting as custodians of nature, cooperating to find a balance between the needs of the planet and human aspirations. The socio-cultural outlook of **Habitania** is less individualistically inclined. It recognizes the need for cooperation and joint responsibility for the environment, encourages more frugal behavior and favors greater equality of wealth and access to resources as a social ideal.

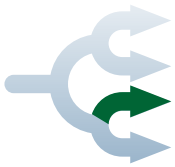
Habitania drivers

Habitania may seem like a very recognizable future, as the 'sustainability' narrative has increasingly found resonance with many consumers, policy makers and even businesses, especially in Europe. Sixteen out of twenty countries with the strongest environmental policies are in Europe (Smith, 2017). Australia, New Zealand, Iceland and Singapore are the only countries outside Europe in the top twenty. The SDGs launched by the UN in 2015 proposed an ambitious agenda to reduce poverty and inequality and to create a "better and more sustainable future for all" by 2030 (United Nations, 2015). According to analysts, the SDGs offer a 12 trillion US dollar revenue opportunity for the private sector (The Business and Sustainable Development Commission, 2017). The following year, 2016, world leaders signed the Paris Agreement on climate change and started to put it into action. Different nations pledged to adhere to nationally determined contributions (NDCs) in a cooperative global effort to limit the rise of global temperatures, and to regularly report on their emissions and on their implementation efforts.

Habitania challenges

The **Habitania** ideal of pursuing a path of sustainable development towards a steady-state circular economy seems logical and worthwhile. There is no doubt that countless consumers are inspired by the idea to recycle and consume more sustainable products for the benefit of the environment. However, even with current best efforts, only 14% of plastic is recycled – the rest find its way into garbage dumps and the environment. Other industrial waste efforts are not doing much better. The pursuit of the sustainability ideal is increasingly becoming questionable as a viable way to save the planet. There is no doubt that approaches like the Circular Economy can help to save non-renewable resources and limit pollution, but at best that simply buy time by slowing down eco-system degradation. They do not offer a long-term solution for repairing and saving the planet.

The perilous decline in biodiversity shows that the ecosystem is in a death spiral and that the 6th major extinction in the history of our planet is under way (Kolbert, 2014). Furthermore, in a recent report, the Intergovernmental Panel on Climate Change (IPCC) paints an alarming picture of humanity's inability to act to keep global warming below a 1.5 °C increase (IPCC, 2018). This is especially critical due to the decline in global governance and cooperation on climate change mentioned earlier, and to the continued increasing demand for fossil fuels.



Three quarters of greenhouse gases, including CO_2 and methane, in the atmosphere have been released since the 1950s. The 'Greenhouse Effect' happens because these gases are nearly transparent to the solar radiation emitted from the Sun, but partially opaque to the longer wavelength thermal radiation emitted by the Earth. This means incoming solar radiation from the Sun passes through the atmosphere and warms the Earth's surface, but Earth's thermal radiation is blocked from being reflected back to space. As the atmosphere warms, there is a gradual heat transfer to the oceans. The oceans also act as a carbon sink and absorb much of the CO_2, but this leads to increased levels of CO_2 in the water, which acidifies the ocean. This is devastating for coral reefs, because the calcium needed to form the coral reefs is dissolved by the warmer more acidic oceans. Furthermore, the CO_2-induced Greenhouse Effect acts slowly, as the ocean takes a very long time to warm. By the time it is noticeable, it is almost too late to salvage the situation. The impact of greenhouse gases generated by human activity since the 1950s will continue to accelerate global warming for even hundreds of years even if we miraculously stop releasing CO_2 today. This is due to the 'long tail effect' of how CO_2 released in the atmosphere is slowly re-absorbed by the oceans and the biosphere (Hausfather, 2010). We also need to keep in mind that the capacity of oceans and the biosphere to sequester CO_2 may diminish over time. Warming oceans have reduced capacity to absorb CO_2. The microbiota in the topsoil of the earth, which plays a key role in re-absorption of CO_2, is becoming less effective due to soil degradation brought about by industrial agricultural practices.

Besides the diminishing capacity of the planet to absorb CO_2, there is also an active acceleration effect. As the oceans warm and the permafrost on land start to melt, they release vast quantities of methane (currently trapped in the permafrost and as a frozen methane clathrate slurry at the bottom of the ocean). Methane is a greenhouse gas that is 30% more potent than CO_2. We are thus dealing with a problem that is able to amplify itself over time and we run the risk of crossing a threshold where we will face an unstoppable runaway climate warming process (Billings, 2013).

Ultimately, the world will require near-draconian measures to enforce regulatory compliance by all individuals and organizations to limit consumption of non-renewable resources. China is implementing a system of social credits, where people are rewarded for 'good behavior' or punished for 'bad behavior'. From a Western point of view, this is seen as a 'digital authoritarianism', enabled by a very intrusive system of digital surveillance, where all forms of privacy are eroded. However, from the Chinese point of view, it is a step towards building an advanced cooperative society. Many populist governments are looking for increased levels of social control and may be inspired to copy or emulate the Chinese model. Is this the level of legislative control necessary to enforce 'sustainable behavior'?

Realistically, 'sustainable' goals will be very difficult to achieve while humans maintain a utilitarian materialistic mindset and while the global economy is driven by the ideals of growth, competition and consumerism. Some of the most renowned ecologists have spoken out that sustainability has dangerous shortcomings as a scientific theory, and it may lead to the false belief that it can stop the ecological decline on earth (Montoya, Donohue, & Pimm, 2018). Ecologists and socio-biologists argue that at least 50% of the earth has to be "given back to nature and re-wilded" to create healthy ecosystems essential also for human survival in the long term (Wilson, 2016).

There seems to be different schools of thought in regards to the concept of 'Sustainability'. Whilst some leading thinkers start to argue for a shift to a steady state economy without growth (Jackson T. , 2009), a number of prominent initiatives continue under the premise of 'Sustainable Growth'.

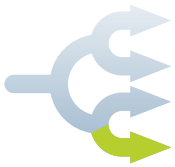
The UN SDGs have been criticized for their interpretation of sustainability as they actively fuel the anthropocentric ideal of progress and development, which will undermine the ideal of sustainability and ecological protection, and in the process increase impoverishment (Adelman, 2018). The mere term 'sustainable development' is an oxymoron, because sustainability requires a steady-state economy, and development implies continued growth. The concept erroneously fosters the illusion of combining endless economic growth on a finite planet, whilst promising social justice and environmental protection. Take the SDGs: they aim to eliminate poverty (SDG1) and create decent work and economic growth (SDG 8), whilst SDG13 focuses on climate action. Clearly these goals are not only contradictory, but also unrealistically challenging. Recent estimates have shown that the drive towards efficiency and automation is likely to put half of humans out of work in the coming decades (The Economist, 2018). This will seriously undermine any efforts to reduce poverty.

Thus, there are serious challenges and causes for reflection for all pursuing sustainability programs in the format proposed by the UN as a realistic means to ensure a sustainable and livable planet.

Gaia

Figure 7: 'Gaia' is the metaphor for the post-anthropocentric Co-Emerging Futures direction. It is based on the belief that ecosystems consist of deep layers of 'eco-entanglement', relationships between biological organisms but also between organisms and their geophysical environment.

Image: Pixabay



The metaphor of Gaia

The metaphor of **Gaia** takes its inspiration from ancient Greek mythology where **Gaia** was the primeval goddess personifying mother earth. The famous chemist and medical doctor, James Lovelock, and renowned biologist, Lynn Margulis, borrowed the name for their **'Gaia hypothesis'**, which they developed in the early 1970s (Lovelock J. , 1972) (Lovelock & Margulis, 1974). Many principles of their compelling theory, which describes a complex dynamic interaction between living organisms and the inorganic geological environment that actively shapes, self-regulates and maintains the necessary conditions for life on the planet, have since been validated by the wider scientific community. **Gaia** compels us to look at our place in the ecosystem not as humans versus the environment, but as active agents that are part of a larger ecosystem. **Gaia** emphasizes the natural dynamic balance and interconnected interplay between all living beings and the geological ecosystem.

The Gaia ideal

Gaia is the second trajectory in the 'preventative' path of Transformation (Figure 3). The ideal of **Gaia** is to focus human activity towards restoring the natural dynamic balance of ecosystems that nourish all life on earth. It is not so much pursuing a deterministic goal but a different balance that would create a vibrant, dynamic and evolving natural ecosystem.

Although this is also preventative view diverging from the trajectory of Transformation (Figure 3), it is rooted in a fundamentally different worldview from **Habitania**. In **Gaia**, people see themselves not as being above nature, but as part of the ecosystem and as 'one' or 'eco-entangled' with nature. It means rethinking all human activity to, at the very least, completely neutralize its impact on the ecosystem, and at best function to act as an active participant that benefits the biological and geological diversity of ecosystems.
In this view, the role of the economy needs to shift from exploiting nature primarily for human benefit, towards becoming a servant of nature. It means that the economy has to deliver value to the entire ecosystem, not only humanity. It calls for new systems of living that are congruent with the way that nature functions.

Humanity has to rethink how to live, consume and produce in a way that puts the needs of nature and a healthy ecosystem first. This requires a transformation of the core beliefs and mindsets of human societies, which I can best describe as nothing short of a 'change of heart'.

Gaia mindset and beliefs

Gaia is a post-anthropocentric worldview that puts the ecosystem above human interests. Its mindset and beliefs are rooted in more ancient Asian philosophies such as Tao, Hinduism and Buddhism, which view the earth and the cosmos at large as an entangled and interconnected whole. This is very different from mindset and beliefs of classical Newtonian science, which has a more 'machine' or 'clockwork' view of the planet. This classical Cartesian world view assumes that if we can analyze and understand how the different components of the Earth function, we can manipulate it like a machine or a deterministic system to create predictable utilitarian benefits for humanity. The **Gaia** view of the universe (and the planet) as a complex, dynamic system of interrelationships that is always changing and transforming is more congruent with Quantum Mechanics, where sub-atomic particles are entangled over long distances, and where it is impossible to separate the observer from the observed.

As mentioned earlier in this paper, there has also been a shift in philosophical thinking away from using logic and objective empirical proof as the only means of arriving at true knowledge. In post-Post-modern thinking, the latest philosophies such as Object-Oriented Ontology and Agential Realism (Harman, 2018) (Barad, 2007) have shifted into the post-anthropocentric realm, where it is postulated that true knowledge cannot be obtained from the representational point of view of a human observer, but that knowledge and consciousness arise from the intra-action and relationships between 'objects'. The term 'objects' is applied in a very broad sense and includes all phenomena - biological, non-biological, macro objects and quantum-level.

This shift in philosophical understanding and scientific theory about the relational nature of reality compels a rethink of humanity's relationship with nature and the cosmos at large.

Gaia drivers

The rising awareness of our interrelationship with nature and our dependence on healthy ecosystems is a key driver towards finding new ways to balance, rethink and re-integrate our lifestyles into natural ecosystems.

The view of a complex, systemic and highly interrelated nature is not only rooted in abstract theory. In the last decade, Western medical science has started to realize how vitally important our connection to nature is for our mental, physiological and genetic health. In the West, the approach to human medicine has predominantly focused on the human body (and different pathologies of the human body). On a cellular level, it has focused on human cells and human genes. But this is changing. In 2007, the Human Microbiome Project (HMP) was launched as a five-year-long international effort to characterize the microbial communities found in the human body and to identify each microorganism's role in health and disease (Rogers, 2011). This project is completely transforming these Western views on human health.

For instance, it has been revealed that the human body consists of human cells and microbial cells (of more than 1,000 different species) in an approximately 1:1 ratio of approximately 100 trillion cells each (Sender, Fuchs, & Milo, 2016). Based on this, the human body can be seen as a 'supra-organism' or an ecosystem within a larger ecosystem, rather than a single organism. This is of course similar for other mammals and all complex organisms.

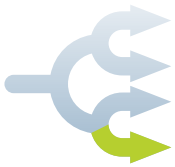
Moreover, recent scientific studies confirm that a healthy microbiome is essential for human health (Wang B. , Yao, Lv, Ling, & Li, 2017). The vagus nerve connects a very high density of neurons around the gut (which almost resembles a second brain) to our brain, and this nerve directly allows microbiota to communicate with the brain (Underwood, 2018). Imbalances in in our microbiome have been linked to a variety of diseases such as Alzheimer's, depression, childhood leukemia and autism, to name a few.

The health of our microbiome is intricately linked to our exposure to our environment, what we eat, how much we exercise and use our bodies. As 'supra-organisms' we – the human species – have evolved our bodies and our microbiota over time. It makes perfect sense that since microbiota come from nature and from the soil in which plants grow, and not only our microbiota, but also our immune systems depend on this interaction with nature. When we live in a compromised environment, our health is adversely affected. In a polluted environment, toxins or pathogens can cause disease. Counter-intuitively, an environment that is 'too hygienic' and over-sanitized can also lead to an increase in human disease. For health, we need a fine balance between hygiene and some exposure to a natural variety of micro-organisms, which are often banished from our modern living environments. Such exposure is important for the priming and development our immune systems. A lack of exposure, especially amongst children can lead to a variety of lifelong disease conditions. There is, for example, a much higher incidence of autoimmune diseases in developed Westernized societies. Diseases such as multiple sclerosis, Crohn's disease, type 1 diabetes, and asthma have soared by 300% or more in developed countries (Scudellari, 2017). Experience of, exposure to and regular interaction with, healthy natural ecosystems are therefore key to our health – for maintenance of our microbiome as well as for optimal functioning of our immune system.

The impact of our interaction with a healthy environment goes even further than that. It has a direct influence on how our genetic make-up functions. Scientific studies are revealing that the functioning of the human genome is far more complex than we imagined. The Human Genome Project, which produced the first DNA sequence of the human genome, revealed the presence of 20,000-30,000 genes. Much of the subsequent scientific interest focused on understanding the function of these genes, because it was believed that understanding how these genes function could be the basis for curing any disease. However, these genes only constitute around 2% of the human genome.

In fact, for a long time, it was believed that 98% of the human genome consisted of junk non-functional DNA, which accumulated over millennia of evolution (Henniger, 2012). This dogma was rooted in Newtonian cause and effect thinking which led scientists to believe that organisms are deterministic machines with a 'software code' (genes) that is edited by the process of natural selection to pursue the best fit and efficiencies during each life-cycle of the organism. Although the role of DNA is key in the genetic make-up of an organism, research in the last decades is increasingly pointing to a far more complex and interrelated model of regulation, where behavior, experiences and ecosystem interaction are key forces driving the evolution of life and also the regulation and expression of the DNA 'blueprint'. Indeed, in the last decade, there has been a surge of interest in the field of epigenetics (the study of biological mechanisms that will switch genes on and off). Epigenetics can potentially revolutionize our understanding of the structure and behavior of biological life on Earth and human health. It explains why mapping an organism's genetic code is not enough to determine how the organism develops or acts and shows how nurture combines with nature to shape biological diversity.

In other words, the regulation of genes is as important as the genes themselves. In its interaction with the environment and its own microbiome, the body has an epigenetic system



that reacts to the environment and controls genes (without modifying the actual gene sequences). Thus, environmental stimuli can also cause genes to be turned off or turned on, with very severe health consequences. Epigenetics can change gene expression if one of the parents have been exposed to stress, disease, toxins, poor diet and nutrition, or has a poorly balanced microbiome. This can lead to health consequences such as obesity, higher likelihood for schizophrenia, cancer or a range of other health afflictions that can be passed on to several generations (Carey, 2013). An interaction with a healthy environment and healthy behavior is therefore as important as 'having good genes'. And the entanglement and synergistic interaction with a high biodiversity of species in the environment is the basis for a healthy and resilient human body.

However, through the impact of the Anthropocene, humanity is witnessing an accelerating decline and collapse of natural ecosystems. The latest report of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (Diaz, 2019) compiled by 145 expert authors from 50 countries over the past three years warns of an unprecedented decline in ecosystem health, and that more than a million species are heading for extinction in the next three decades.

From a purely utilitarian view, many people are becoming concerned about the impact on our food supply of collapsing ecosystems.

In the ocean ecosystem collapse is brought about by global warming, plastic and other pollution, and the over-exploitation of fish stocks. Terrestrial ecosystems face similar challenges due to soil depletion, pollution and the destruction of biodiverse natural habitats. Bee populations are rapidly declining on a global scale (Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES), 2016). The disappearance of bee species will have disastrous consequences for natural ecosystems and for the security of our human food chain. We have put natural ecosystems at grave risk of starting to collapse like dominoes, which will put our own continued existence on the planet in grave jeopardy.

In response, a growing number of people around the globe are driving the shift towards an eco-entangled approach to living on our planet. Many people are beginning to understand that in order to save nature and ourselves, we need a drastic change of path that requires a rethink of modern civilization, development and urbanization, consumption and economics, and most importantly humanity's relationship with nature.

A number of ecologists agree that the only way to save nature is to reverse much of the human footprint, which has resulted in 77% of the Earth being heavily influenced by human economic activity, and to create connected ecosystems, free from human economic activity for at least 50% of the planet. Edward O. Wilson, a famous entomologist from Harvard University calls it a moral duty of humanity to dedicate half of the planet for undisturbed wildlife and half for humanity (Wilson, 2016). In his book 'Feral', George Monbiot argues passionately for the need to regenerate and 're-wild' vast swaths of rural agricultural landscape and to learn to co-exist with nature and wild animals. And a number of prominent non-profit foundations have now created a movement to realize the 'half-Earth' idea of re-wilding. Such organizations include the Wildlands Network, the Rewilding Institute and the Wild Foundation.

This may sound like an impossible dream, but a recent publication in the journal *'Science Advances'* shows how to achieve it. The authors propose an extensively researched and meticulously laid out 'Global Deal for Nature' (GDN). It is a time-bound, science-driven plan to save the diversity and abundance of life on Earth. Pairing the GDN and the Paris Climate Agreement would avoid catastrophic climate change, conserve species, and secure essential ecosystem services. (Dinerstein, et al., 2019). Amazingly, their plan is affordable. They have calculated a cost of around 100 billion US dollars per year to put the plan in action. This is a small fraction of the projected global GDP of 143 trillion US dollars for 2019 (International Monetary Fund, 2019), and an almost negligible amount if we consider what we have to lose.

Gaia challenges

The chasm between these two transformative future trajectories, **Habitania** and **Gaia**, is deeper than it appears at a glance. Embracing the **Gaia** ideal requires far greater systemic change than simply setting deterministic goals for recycling and curbing consumption levels. There are many challenges to face if humanity wants to transform societies towards eco-entanglement. It starts with an individual transformation. It means we have to shift to a post-anthropocentric mindset and lifestyle, which is inherently post utilitarian and post materialist. This cannot be achieved through small token changes. Instead, it requires a systemic shift in each of our personal relationships with the planet that will affect everything we do.

Changing values, mindsets and way of thinking:
As mentioned before, **Gaia** requires a 'change of heart' on a personal level. As individuals, we need to subdue our own subjective ego and develop a connected eco-identity, where we become and feel 'one with nature' and become constantly aware that we are part of an ecosystem. This shift in adopting an inclusive identity is an essential step if humanity is to change its relationship with nature. The

second step is to inspire other people around us to make this transition towards creating a culture that is rooted in eco-centric connection. For centuries people have been imbued with the anthropocentric mindset of placing themselves above nature. In the **Gaia** paradigm, we should not even see ourselves as custodians. We should see ourselves as equal participants in nature. We benefit from nature, but as part of nature, we need to act synergistically and ensure that nature as a whole benefits through our interaction, not only humans. We need to learn to think in open complex systems, not in terms of goals or in terms of deterministic systems that we can manipulate and exploit for our own benefit. We need to act with great generosity to support the regeneration of resilient ecosystems with thriving biodiversity, in which we can also have a thriving future as participants.

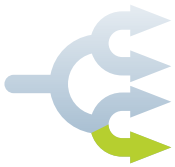
Re-connecting with nature: Re-connecting with nature is not only a cerebral process, but one that requires the development of a deeper emotional and spiritual connection. Centuries of technological progress and shaping artificial living environments towards comfort and efficiency have severely diminished our human ability to feel and experience a deep connection with nature in most modern societies. Humanity has built much of its civilization on conquering nature and treating it as 'décor' in its living environments. We have lost many of the finely tuned senses that we developed as humans over hundreds of thousands of years that allowed us to sense and tune to nature. Living in industrialized city environments, devoid of natural ecosystems has muted and diminished many of these senses.

A number of fascinating studies over the last few years have shown that humans have a very complex olfactory (smell) system, which is under-developed due to limited exposure to nature in artificial modern living environments. Humans also have the genes that allow us to sense magnetic fields like some migratory animals, but in environments polluted with electromagnetic fields caused by modern electronic equipment, this sense has been largely lost (Wilke, 2019). Moreover, there are numerous examples of proven interspecies communication in nature (Kull, 2008). Much of this inter-species communication is related to the transfer of sound, gesture or chemical signaling. Chemical signaling is either direct (e.g. between plants and the micro-rhizome) or via olfactory (smell) sensors in the case of vertebrate animals. Humans have 'unconscious' levels of communication e.g. chemical sensing or smell that can trigger fear, etc. However, our communication is dominated by rational visual and verbal symbolic semiotics (Colavita, 1974), and many of our primal senses are diminished due to our lack of interaction with natural environments.

Equally surprising to many are Schumann resonances – first discovered by the German physicist W. O. Schumann between 1952 and 1957. These consist of a range of extremely low frequency pulses (ELFs) generated between the terrestrial surface and ionosphere, where a resonating cavity is formed. The fundamental Schuman resonance of 7.83 Hz is the strongest of the seven resonances and is in the human alpha brainwave range. This frequency is below human auditory limits but can nevertheless be perceived directly by the brain as a rhythmic pulse. In fact, all the Schumann resonances correspond to several frequencies related to human brainwave activity. They range between 6 and 50 cycles per second, specifically 7.8 (alpha), 14 (low beta), 20 (mid beta), 26 (high beta), 33 (high beta), 39 (gamma) and 45 Hz (gamma), with a daily variation of about +/- 0.5 Hz.

Numerous studies have linked these waves to the health of biological systems, as they appear to be instrumental in guiding the circadian clocks of organisms, including humans. They have been shown to play a role in human psychobiological health and well-being. In modern human habitats, these waves can be obscured by electro-magnetic noise generated by our technologies, resulting in adverse long-term health consequences due to disruption of our circadian rhythm. Schumann waves have been associated with the regulation of blood pressure, deep relaxation and sleep in humans (Mitsutake, et al., 2005). This may explain why spending time in nature, away from all electromagnetic disturbances, may have a healing effect.

Many organisms have magneto-reception and can detect the Earth's magnetic fields. For example, honeybees, salmon, turtles, birds, whales, and bats use the geomagnetic field to help them navigate. It turns out that many humans can also unconsciously sense the arth's magnetic field (Wang, et al., 2019), but this skill has probably been severely been diminished in modern humans. It was most probably active during our hunter-gatherer phase thousands of years ago. Another 'sense' is determined by how our brains are wired. Recent studies have shown that exposure to (even low levels of) psychedelic drugs lead to dramatically enhanced neuroplasticity in the brain cells of rats and flies (Ly, et al., 2018). This work has demonstrated that such exposure has long-lasting effects and that psychedelics promote plasticity via an evolutionarily conserved mechanism. In human history as hunter-gatherers and foragers, we would have been regularly exposed to low levels of mind-altering substances (e.g. psilocybin in hallucinogenic mushrooms). Today, with an agriculturally produced food chain, the small quantities of plants containing such naturally occurring psychedelic substances have been largely eliminated from human diets. Yet, it has been shown that such substances may play a role in treating neuropsychiatric diseases such as anxiety disorders, post-traumatic stress disorders and depression (due to the mechanism of increased neuroplasticity) (Hartogson, 2018).



Indeed, it is hypothesized that regular exposure of the human brain to low levels of such psychedelics played a crucial role in the development of human intelligence, consciousness and even the human sense of spirituality, and they could play a role in future therapy (Hartogson, 2018). It could be said that the modern industrial diet diminishes the human sense of spiritual connection by altering the way in which the neurons in our brains are connected and function. In a way, our diet and lifestyle condition us for an existence dominated by rationalism. So, to reconnect to nature, we need, among other things, to re-develop some of our lost (or diminished) senses either through re-training or with the support of technology.

Rethinking our food chain: Humans, i.e. Homo sapiens, is arguably the only species that has managed to take itself out of the food chain. Although human beings constitute only 0.01% of the biomass on Earth, they have a disproportionate impact on the health of ecosphere. Combined with our livestock, we outweigh all other wild mammals by 20-fold. In the last 10,000 years since the dawn of the agricultural age, human activity has slashed plant biomass by half and reduced wild mammals by 85% (Dalley, 2018). We are still clearing vast areas of natural forest to make way for unsustainable food production. Each year 13 billion hectares of forest are cleared for agricultural expansion. Twenty-six percent of the (ice-free) land of the planet is now used for livestock grazing. Thirty three percent of croplands are used for livestock feed production, and livestock contribute to 7% of the total greenhouse gas emissions through enteric fermentation and manure. In addition, rising incomes in developing countries have led to a surge in demand for meat and dairy products, with experts predicting a 50% rise in demand by 2050 (Worldwatch, 2019). Highly concentrated animal feeding operations, or factory farms, with very poor conditions for livestock supply the vast majority of this growing demand for animal products. Worldwide, around 56 billion animals are now raised and slaughtered for food each year (Koneswaran & Nierenberg, 2008).

Similarly, industrial grain, fruit and vegetable farming are based on practices that rely on vast tracts of land covered with monoculture crops that are pushed for yield by excessive fertilizer and pesticide use, creating not only soil depletion, but dangerous run-offs of chemicals into water streams, the ocean and the broader environment.

In today's globalized economy much of the demand is driven by wealthy urban consumers who demand food variety, convenience and low prices. There is a growing demand for packaged food by consumers due to the quickening pace of life – in 2017 the food packaging industry size was estimated at 277 billion US dollars in a market research report published by Grand View Research. Increasing consumption of fast-food snacks instead of traditional food is anticipated to further boost the demand for plastic-based packaging, which also has a devastating environmental impact. Food is shipped across the globe to satisfy the fickle demands of wealthier consumers, at great cost to the environment, and leading to an explosion of lifestyle-related diseases such as cancer and diabetes in developed countries due to poor nutritional quality and over-processing that creates harmful constituents in food.

Moreover, an estimated 1.3 billion tonnes of food, or roughly 30% of global production, is lost or wasted annually, according to the UN Food and Agricultural Organization (FAO), while 800 million poor people regularly go hungry (Arsenault, 2014).

How can a shift towards eco-centric address these problems? There is a growing 'Regenerative Agriculture' movement in many countries across the globe that is starting to challenge the industrial agricultural model. Regenerative Agriculture is a system of farming principles and practices that increases biodiversity, enriches soils, improves watersheds, and enhances ecosystem services. Regenerative Agriculture aims to capture carbon in soil and above-ground biomass, reversing current global trends of atmospheric accumulation. It differs from mono-crop industrial farming in that it minimizes or eliminates the need for pesticides and chemical fertilizers by growing crops in ecologically diverse fields, and by using composting to create healthy soil microbiota that are effective in bio-sequestration of greenhouse gases and in enhancing the nutritional value of crops. Such crops may be more labor intensive to harvest, but many farmers report improved yields and economics, whilst producing crops as part of a healthy and sustainable biodiverse ecosystem, rather than clearing land for crop production or reserving land exclusively for production of single crops. An increasing number of restaurants and on-line food retailers have joined this initiative and now exclusively use produce from regenerative farming. In 2017, the food company Danone announced that it is also working with its suppliers to shift towards regenerative agriculture (Danone, 2017).

Equally important is speeding up grassroots movements to move modern diets from convenient fast food and fads towards authentic local regenerative food production and consumption, with more seasonal products instead all year-round availability of produce from globalized food chains. Such a shift will put local consumers more in touch with local producers. It can lead to better health outcomes; reduced waste and food spoilage; decrease packaging, energy and costs, and increase local empowerment.

Rethinking our approach to health: Healthcare costs are rising to unsustainable levels worldwide. Unhealthy eating, unhealthy lifestyles, and exposure to an unhealthy environment exacerbate this dilemma. Human populations end up spending a fortune on expensive healthcare remedies, because humanity has created ecological conditions where our bodies are unable to stay healthy and stave off disease.

In addition, hospitals are dealing with the rising threat of pathogens that are resistant to a wide spectrum of antibiotics. This will not only impact the effectiveness and cost of future hospital care but may dramatically raise the risk of hospital treatment. Studies have shown that a healthy microbiome can make a dramatic difference in the health resilience of populations, and that 'dysbiosis therapy' (treatment to restore a healthy microbiome in the human body) can dramatically reduce the need for antibiotics in hospitals. A growing body of evidence suggests that critical illness and over-use of antibiotics is a source of Intensive Care Unit (ICU) dysbiosis. This causes increased ICU infection, sepsis, and multiple organ dysfunction syndrome. Probiotics and fecal microbial transplant (from donors with healthy microbiomes) show promise as ICU therapies for infection (Wischmeyer, McDonald, & Knight, 2016).

These challenges call for a shift in healthcare from treating illness towards recognizing the body as a connected ecosystem. Increasingly studies confirm the importance of a healthy gut microbiome for physical and mental health. The microbiome also plays a key role in optimizing the nutritional value we can derive from food. (Schreiner, Kao, & Young, 2015). Thus, our health regime should focus on nurturing a healthy body ecosystem. By investing in healthier environments, healthier eating and more physical interaction with nature, we can strengthen our microbiomes and become far more resilient and healthy.

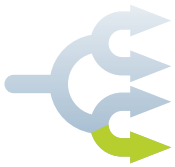
Changing our lifestyles and aspirations: Living in an entangled way with nature requires designing, producing and consuming in a different way. It seems impossible to move the societies of today towards a post-anthropocentric, post-utilitarian and post-materialist philosophy of existence. However, some of these values are already manifesting themselves amongst the millennial generation. Several reports from around the globe have shown that Millennials prefer having access to services rather than owning material assets. Millennials are far less likely than previous generations to buy houses and cars. They prefer to rent accommodation and use services like Uber or public transport to get around (Thompson & Weissman, 2012). Furthermore, Millennials are far more likely to look for meaningful employment than simply earning money, and to work for a lower salary if the vision and mission of an employer is congruent with their beliefs (Moore, 2014).

In fact, many of the millennial generation prefer to work for themselves, rather than for employers. They are also more interested in work-life balance than spending every hour competing to get ahead in corporate life (Jenkins, 2018). Millennials make up 30% of the world population and are the first generation that has grown up in a world where they are confronted with stories of climate change, species extinction, sea level rises and an unstable future world on a daily basis. Despite being the most educated generation, they also face uncertainty over their future employment as the rise of AI and job automation are expected to erode 47% of all jobs in the coming 25 years (Frey & Osborne, 2013). A recent study showed that 87% of Millennials believe that companies should address urgent social and environmental issues (Farell, 2019). They are far more likely to avoid buying products that are known to be environmentally harmful than any earlier generation. Interestingly a recent study found that Millennials are less likely to recycle than other generations, but are more likely to buy from companies making a positive impact on the world (Shelton Group, 2017).

Many Millennials in developed countries are so concerned about the future of the environment that they are considering not having children of their own, which has created a shift in attitudes towards adoption. Millennials feel they have more at stake than any other previous generation when it comes to matters of health and the environment. There are waves of protests against climate change sweeping the world, led by Millennials. Much of the inspiration from this can be tracked to bold teenagers like the Swedish teenage activist Greta Thunberg, who has inspired children to skip school to protest against climate change (BBC, 2019). Since then, she has become a global phenomenon, speaking at the UN and Davos. Her protest has inspired hundreds of thousands of young activists around the globe. It is clear that the global zeitgeist is changing, and that the wave of change towards an eco-centric lifestyle will be driven by young Millennials.

The window for hope is closing rapidly. Over 60 climate experts warned that humanity only has a few years to stop the worst damages of global warming, and while we cannot repair the damage to the ecosystem within the next few years, our planet may be fatally wounded if we do not act decisively and effectively in the short term (Harvey, 2017). This wave of grassroots action can contribute towards raising awareness, inspiring others to take action to create societal pressure for political and economic change that puts the environment first.

Changing politics and our legal systems: The time has come to question many of our assumptions about quality of life, standard of living, the meaning of poverty, the ethics of wealth, to name a few. In a world where people find meaning in reconnecting with nature, we as humans, need



to think in terms of sufficiency and meaning, rather than in terms of standard of living, poverty and wealth. We will have to embrace a culture of commons and sharing, and create the political, legal and personal will to let go of private ownership of assets that get in the way of repairing our planetary ecosystems.

Nature is slowly gaining international rights and legal and political systems will face new challenges to adapt. Columbia's highest court gave the Amazon rainforest in Columbia the same rights as a human due to grassroots pressure from a group of 25 young people who sued the government for neglect after it was revealed that deforestation had increased by 44% from 2015 to 2016 (Moloney, 2018). It has ordered the government to act immediately. The plaintiffs argued that the government's failure was jeopardizing their future and violated their constitutional rights to a healthy environment, life, food and water.

The same has started to happen in other countries. New Zealand's Whanganui River is a person under domestic law, and India's Ganges River was recently granted human rights (Tanasescu, 2017). In Ecuador, article 71 of the 2008 Constitution states that nature *"has the right to integral respect for its existence and for the maintenance and regeneration of its life cycles, structure, functions and evolutionary processes"*. In practice, that means that all persons, communities, peoples and nations can demand that Ecuadorian authorities enforce the rights of nature. One of those rights, according to article 72, is the right to be restored (Tanasescu, 2017).

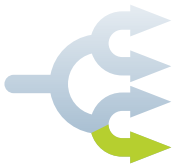
Rethinking Design, Design thinking, and Technology:
Designing for an eco-entangled world, where the benefits for nature are put ahead of human needs requires a complete rethink and re-imagination of our approach to design. The mantra everywhere today is Agile, Lean and Design thinking. This has gained ground not only in the discipline of Design, but has also been applied in many different areas in corporations and other organizations a creative approach to problem-solving. IDEO, the famous design agency, has defined design thinking as follows: *"Design thinking is a human-centered approach to innovation that draws from the designer's toolkit to integrate the needs of people, the possibilities of technology, and the requirements for business success"*. It also means that Design thinking in its current format is very much anthropocentric and puts the need for creating customer and business value above everything else.

Design thinking typically follows an iterative approach to solution design. This consists of a cyclic process of prototyping a number of possible solutions to a well-defined problem, followed by testing, analyzing, and refining a product or process. Current design thinking is, however, still mostly based on linear reductive thinking, albeit in an iterative way to evaluate a number of solutions for the best fit to a problem whilst optimizing the business value potential. The creative solution-seeking processes we use today in Design, Engineering and Business still maintain largely an analytical worldview that compels us to look at a problem as a component in a deterministic machine of which we can manipulate the inputs and outputs by reconfiguring the building blocks. This works well to design an optimal proposition that will appeal to a customer by solving a recognized need. However, in an eco-entangled world, design becomes far more complex. Suddenly, we are not only designing for a customer but for the benefits of an eco-system (of which the 'customer' is one stakeholder with a specific need). This requires a deep intuition and understanding of the principles and relationships in such an ecosystem. Most of our current design and technology solutions do not take value to such ecosystems into account. How do we design for best fit into complex eco-systems?

In rethinking design, we would be wise look to nature as a source of inspiration. The disciplines of design and engineering increasingly incorporate principles of biomimicry, but often we only exploit and incorporate some clever elements from nature, but not the entire process of how everything in natural systems is fully integrated. Most of our current processes are based on economics of scarcity (which is a key principle of the consumer economy). And thanks to rising awareness about sustainability, our designs often aim to minimize waste. Nature functions in a very different way. Nature is based on abundance and generosity, not scarcity and frugality. Nature generates a lot of waste, but the waste of one organism is the food of another. Our problem is that we generate the wrong type of waste. Most of our waste is toxic to other organisms (including ourselves) instead of being a source of food (Weber, 2016).

The greatest challenges to future design and technology is to harmonize our materials and principles of solution creation with nature and natural ecosystems. (This shift includes both design and materials.) In the distant past, humans developed tools and products using natural materials that were not foreign to nature. With the advances of the industrial age, and our expanding knowledge of chemistry, nanotechnology and material science, we have developed a range of materials and products that we are able to mass produce and that have led to an accumulating toxicity to nature. We have always only calculated the cost of production, the value to customers and the profit to business, which is what has brought us to the dilemma of the Anthropocene.

The complexity of re-integrating our design and material processing in natural eco-systems may be beyond the ability of traditional design processes. However, AI may emerge as a savior. If we can combine the vast knowledge of material



science and design with a knowledge base of ecosystem function and metabolism, new deep-learning algorithms AI can perhaps help us to design solutions that are beneficial to humans and nature at the same time. This may be the most likely avenue to takes us to eco-entangled design.

Moreover, there are many recent advances in material science that may serve as a starting point to replace some of the most toxic substances in our design arsenal and narrow the gap between human design solutions and the needs of nature. One such example is a recent discovery regarding limonene, which is a carbon-based compound produced in more than 300 plant species (Cornell University, 2005). In oranges, it makes up about 95% of the oil in the peel. With the help of a special catalyst, limonene can be combined with CO_2 and converted into polylimonene carbonate, which has many of the characteristics of polystyrene, a petroleum-based plastic currently used to make many disposable plastic products (Hauenstein, Agarwal, & Greiner, 2016). Polylimonene carbonate can be regarded as an example of the perfect green platform polymer, from which many functional materials can be derived. Since limonene is not a food source, but a by-product of the orange industry, the use of this compound for creating biodegradable plastic does not create competition with the human food chain. Through genetic engineering of bacteria known as cyanobacteria (specifically the cyanobacterium *Synechococcus elongates*), researchers are now able synthesize limonene in a bioreactor, using sunlight and CO_2. This is a scalable approach which offers great advantages over the volume limitations of using orange peel waste as a resource for limonene extraction (Halfmann, Gu, Gibbons, & Zhou, 2018). Such approaches can play a crucial role in addressing the world's plastic problem. There are many other examples of promising biodegradable materials that can be derived from nature with the help of modern technology which can be used as a base for transforming current solutions into biodegradable products that can be more easily assimilated by nature when disposed. Another example is 'superwood' (or 'nanowood'), a highly densified form of wood that has the strength and flexibility of titanium alloy yet is lighter and cheaper. As a new material it can ultimately transform the way we build cars, airplanes and even construct buildings. Another great feature of superwood is that it can be made from fast-growing balsa wood, so does not require higher density slow-growing wood for its manufacture. (Kahn, 2018).

Changing our economic system: Lastly, we have to address the elephant in the room. The current global economic system is fueled by access to credit and is therefore in need of constant growth and consumption (to repay debt and produce shareholder profits). There is a continued push to discover or develop new markets for consumption.

This is a major obstacle preventing an effective response to our planetary challenges. Such a system is extremely difficult to reform, although slow progress is being made through bureaucratic legislation to set standards for industries. But in our globally connected economic world, there is little appetite for anything that may cause economic uncertainty and instability. Many experts agree that the current capitalist economic model based on the need for growth is an unsustainable pyramid scheme that will implode. Even the UN drive to eradicate poverty is rooted in unhelpful conventional thinking that focuses on raising income to create new consumers with disposable income, rather to argue that poverty is based on a lack of sufficiency and access of groups of people to resources as a result of unfair exploitation, which need to be corrected. The book *'Prosperity without Growth'* is one of many examples of books and papers that have been published about the need to shift towards an economy without growth in order to save the planet, reduce inequality and transform the aspirations of what constitutes 'quality of life' (Jackson T., 2009). As radical as the book was only a few years ago, today it has become part of the mainstream dialogue. However, it remains unlikely that sufficient reform will come from the main beneficiaries of the current economic system. For instance, today, even democratic governments rely on corporate donations that come with corporate influence. Those who are disenfranchised by global economics, not those who benefit from it, will be more likely to drive the change. As we move towards economic realities of slowing global growth and rising instability, the disenfranchised are increasing the pressure for real change, as with the on-going yellow vest demonstrations in Paris. Factors such as social instability, wars fueled by climate change, and the continued drive towards automation that will limit job opportunities in the labor market, will only add to this pressure.

Perhaps we have reached a stage where we can start to ask big questions. Solutions are not emerging from today's global economic systems because the incentives are too low. What if the shareholders of public corporations were held accountable for the social and environmental impact of the businesses they invest in? Can we imagine an AI system based on deep learning that analyses the full impact (or contribution) to the environment of corporations and sets tax rates accordingly? What would investors do if corporations with a negative net environmental impact were taxed at 90% (or higher) and those that have a net restorative contribution to the planetary ecosystem paid zero tax? I am not proposing these questions as a solution; I am merely using them provocatively to make a point. This is the level of intervention that will shift our economy from being an exploiter of the environment towards a servant of the environment.

Conclusion and way forward

This paper introduces a framework that makes sense of streams of future change. The purpose is to stimulate debate and action across a wide variety of potentially interested stakeholders from business, design, science, engineering, public sector, politics, academia, non-governmental organizations, media and the general public.

It follows an earlier paper that explores how socio-economic value creation is shifting in a changing world (Brand & Rocchi, 2010). This current paper does not focus on human value creation alone, as it recognizes that life on planet Earth faces an existential threat due to the impact of the Anthropocene. It therefore includes a future trajectory that puts the needs of the planet above the needs of human consumers. I hope this will serve as inspiration to stimulate a rethinking of our approach to innovation, design and value creation.

The emergence of a complex meta-systemic future

The four Co-Emerging Futures described in the text are destined to shape the future of humanity and our planet at large. Each of these futures has support among distinct groups of people who share common beliefs and mindsets backed by substantial economic investments, social interests and philosophical resonances. We should therefore not view the four future streams as alternative scenarios but as Co-Emerging Futures. For each of the four futures, it is possible to imagine a number of scenarios of how these may develop, but that I will leave as input for follow-up debate and reflection.

However, all the future directions are influenced by a number of macro changes that will introduce complexity and uncertainty.

On an ecological level humanity is facing the perils of climate change driven by the activities of the Anthropocene. We already see the impact on ecosystems that are starting to collapse and unpredictable weather patterns that will threaten the stability of human civilizations.

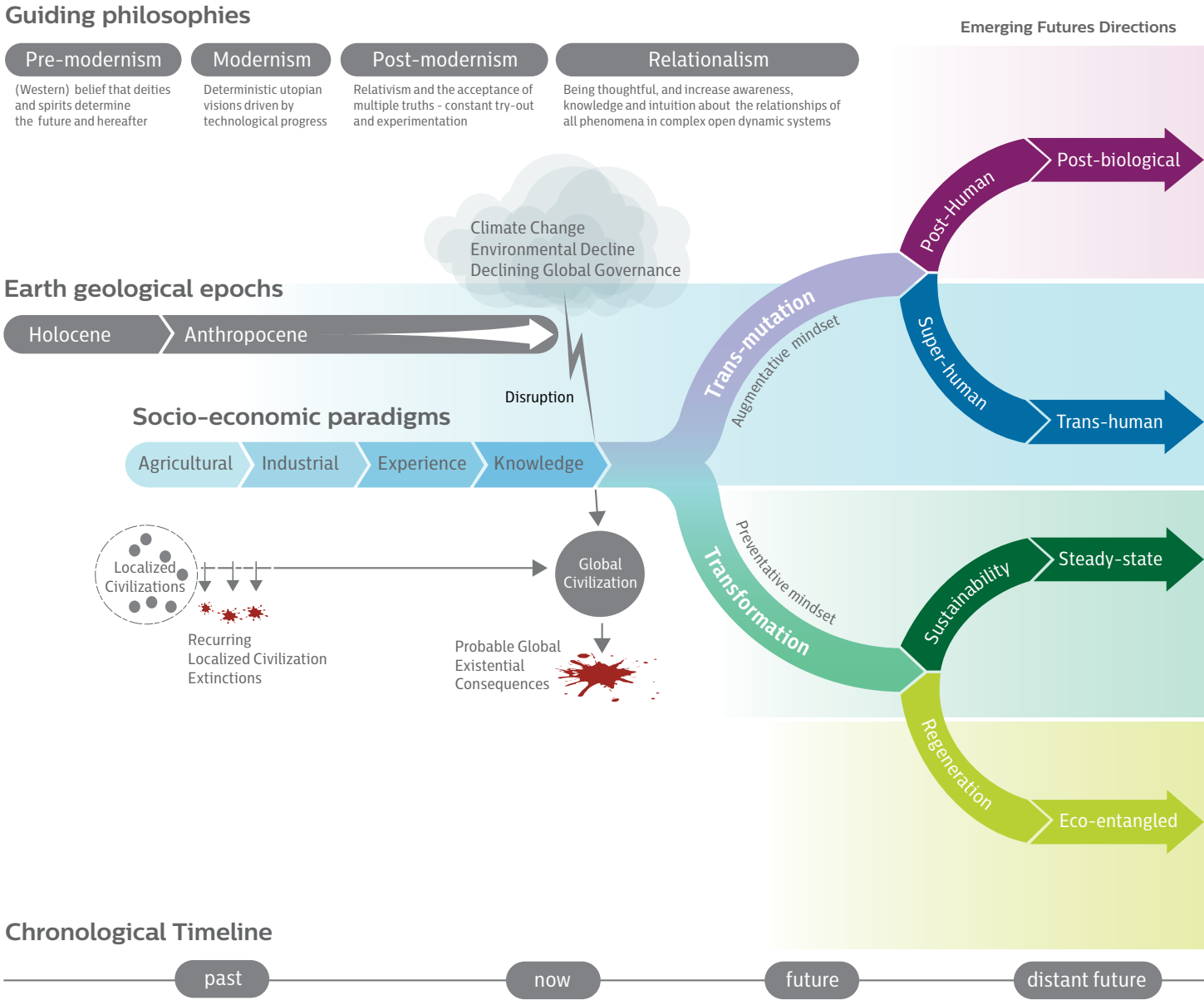
On a political level, there is a growing ideological vacuum as institutions of democracy and liberalism are weakening. This weakened global governance and a rise in populism are evident worldwide.

Economically there is a shift into a post-globalization world where free-trade is being questioned (Saval, 2017). In this world, we may see more regional economies, local priorities and a possible fragmentation into different alternative economies (such as local collaborative economies, Bitcoin, etc.) (Nelson & Timmerman, 2011).

Technologically, there is rapid progress towards a pervasively interconnected world where there is less need for labor due to automation enabled by AI and robotics. Remarkable progress is being made in many areas such as material science, regenerative medicine and AI, but the challenge is to make access to this progress available to all people, and to ensure that it creates benefits for the environment and not an additional burden.

On a societal level we see a polarization of streams of increasingly insular opinions and a decline in the possibilities for civil debate, fueled by social media echo chambers. There is also a strong resentment building against the realities of rising inequality and the threat of unemployment due to technological automation. Plus, public awareness about climate change is increasing, as made evident by the recent mass demonstrations about climate in several countries in Europe (Taylor, 2019).

Humanity, therefore, has to prepare not for a single future, but for a future that will develop into different directions, fueled by different beliefs and interests.



Reflections and actions

Each of the Co-emerging futures described in this paper (Figure 8) contains a wealth of seeds for reflection, and discussion. As individuals, we may have different preferences based on different worldviews. These future directions may challenge us to take a step back and reflect on our planet, our place in it, and on the potential long-term consequences of our behaviors, goals and choices. The Anthropocene has been accelerated more by the un-intended consequences of our technologies and actions, rather than by the intended goals of humanity. Given the precarious state of our planet, there is a need for a deep mindfulness as we go forward.

In Philips Design we will follow up with more publications, and a number of activities and collaborations around this topic.

We are starting creative sessions to reflect on how the role of Design, and the approach and tools of Design may have to adapt. We will also explore how the different streams of technology development may be adapted and utilized in the different future streams that are described in this paper. We have started collaborations with a number of academic institutions (Technical University of Eindhoven and the Design Academy Eindhoven) and an experimental designer, Frank Kolkman (Kolkman, n.d.), to use 'design probes' methodology. This method uses 'Design Fiction' to design provocative future visions based on the four futures directions. Making interpretations of these futures tangible for public debate, it can ultimately influence perspectives and stimulate a rethink of the innovation strategies of today.

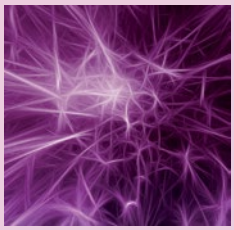
Underlying myths / values	Premise	Philosophy	Mindset	Approach	Metaphor
Sentio-centrism Valuing Intelligence above all	Abandon biology as carrier of intelligence (beyond nature)	Singularity	Post-identity Hive-mind	Boundless knowledge immersion & assimilation	**Etherea** 
Anthropo-centrism Valuing human progress above all	Shape the earth for human civilization (on top of nature)	Utilitarianism	Individualistic Opportunism	Control human evolution and optimise human habitat	**Immortalia** 
Resource-centrism Valuing sustainable prosperity	Adapt human civilization for sustainable production & consumption (next to nature)	Egalitarianism	Cooperative Pragmatism	Manage & sustain a steady flow of resources for human exploitation	**Habitania** 
Eco-centrism Valuing biodiverse ecosystems	Adapt human life to nurture a healthy planet (part of nature)	Holism	Ecologically embodied and thoughtful	Strive for geo- & bio-diversity & quality of the natural & human environment	**Gaia** 

Figure 8: Co-emerging futures – Summary. Created by Reon Brand. Copyright: Philips Design

The paper opens up a number of topics that deserve more in-depth exploration. We hope that it may stimulate other interested groups worldwide to further explore such topics.

Examples of such topics that deserve further debate and exploration might include:

- Eco-entangled materials and eco-centric design
- Economic models for the four future streams and how they may co-exist
- Eco-entangled approaches to healthcare

I hope that this paper inspires people to look at the future and their role in it with new eyes.

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