北京大学博古睿研究中心
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TECHNOLOGY AND SOCIETY

# HUMANITY IN 30 YEARS

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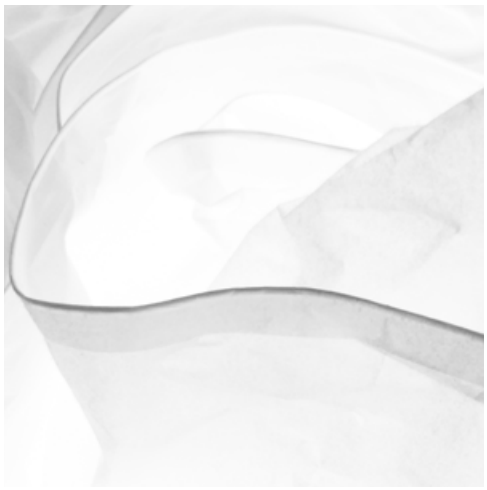

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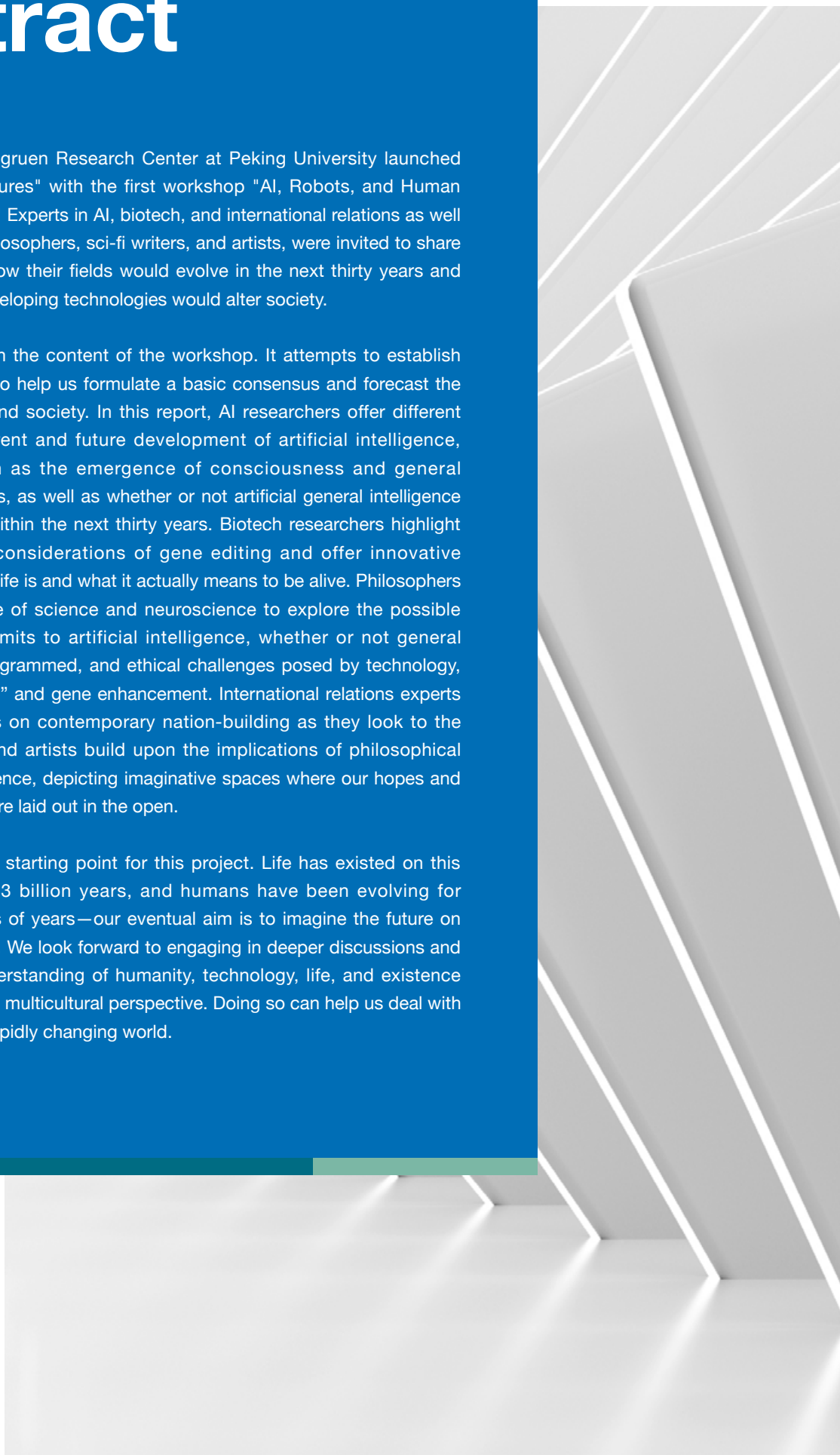
# Abstract


## Summary

In July 2021, the Berggruen Research Center at Peking University launched project "Imagining Futures" with the first workshop "AI, Robots, and Human Society in Thirty Years." Experts in AI, biotech, and international relations as well as forward-thinking philosophers, sci-fi writers, and artists, were invited to share their thoughts about how their fields would evolve in the next thirty years and how they predicted developing technologies would alter society.

This report is based on the content of the workshop. It attempts to establish three future scenarios to help us formulate a basic consensus and forecast the future of technology and society. In this report, AI researchers offer different appraisals of the current and future development of artificial intelligence, covering topics such as the emergence of consciousness and general intelligence in machines, as well as whether or not artificial general intelligence (AGI) will be realized within the next thirty years. Biotech researchers highlight some of the ethical considerations of gene editing and offer innovative interpretations of what life is and what it actually means to be alive. Philosophers incorporate knowledge of science and neuroscience to explore the possible existence of logical limits to artificial intelligence, whether or not general intelligence can be programmed, and ethical challenges posed by technology, such as the “data gaze” and gene enhancement. International relations experts incorporate reflections on contemporary nation-building as they look to the future. Sci-fi writers and artists build upon the implications of philosophical concepts and hard science, depicting imaginative spaces where our hopes and fears about the future are laid out in the open.

Thirty years is just the starting point for this project. Life has existed on this planet for more than 3 billion years, and humans have been evolving for hundreds of thousands of years—our eventual aim is to imagine the future on even larger time scales. We look forward to engaging in deeper discussions and strengthening our understanding of humanity, technology, life, and existence from a multidisciplinary, multicultural perspective. Doing so can help us deal with the challenges of our rapidly changing world.

# Project Background and Research Methodology

## Background

The Berggruen Institute is committed to utilizing the resources of both Eastern and Western thinking to explore the challenges of emerging technology, inspire an interdisciplinary approach, and connect past and future topics. We hope to combine ideas from different fields so that we can better understand this transformative human era and its future. In May 2021, the Berggruen Institute and the East-West Center in Hawaii held a joint forum on AI, privacy, and social cohesion, which included a highly inspiring envisioning of possible scenarios for the near future. We aim to incorporate a similar approach to imagining the future of human technology on an even broader scale, as well as respond critically to possible risks and opportunities therein.

## Purpose

- Attempt to predict the possible impacts of technology over the next thirty years
- Assemble professionals from different fields to inspire one another and achieve common insights into the future of technology
- Motivate further dialogue to build a value foundation for technology advancement

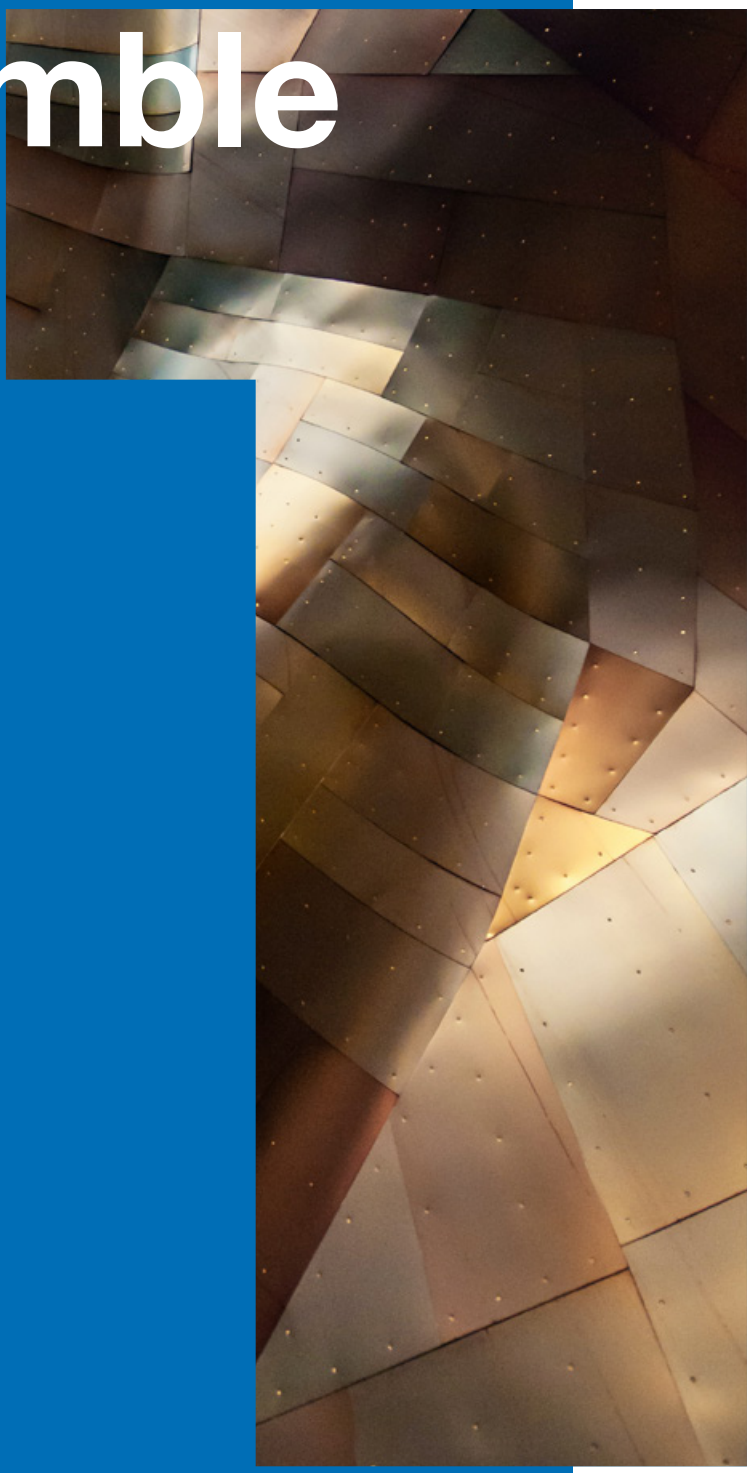
## Methodology

- Closed-door conference, allowing participants to share their thoughts freely and interact with one another
- Philosophers, scientists, international relations scholars, and artists (sci-fi writers and contemporary artists) lead discussions, leaving ample time for dialogue and imagining possible futures

## Primary participants (in alphabetic order)

- Bai Shunong, Professor, School of Life Sciences, Peking University
- Baoshu, Sci-fi Writer, Translator
- Chen Xiaoping, Director, Robotics Lab, University of Science and Technology of China
- Duan Weiwen, Professor, Institute of Philosophy, Chinese Academy of Social Sciences
- Huang Tiejun, Associate Dean, Institute for Artificial Intelligence, Peking University
- Liu Xiaoli, Professor, School of Philosophy, Renmin University of China
- Lu Yang, Independent Artist
- Xia Jia, Sci-fi Writer, Associate Professor, Chinese Literature Department, Xi'an Jiaotong University
- Zha Daojiong, Professor, School of International Studies, Peking University
- Zhang Xianglong, Professor, Department of Philosophy and Religious Studies, Peking University

# Preamble



## 1.1 Technological change and future challenges

The future of technology is changing the world as we speak, driving the emergence of new climates and swaying global development. But how can we find stability amid technological change? How can we be more prudent amid this uncontrollable tide of technological advancement? These are questions that any thinker who is serious about the future of humanity must consider.

The French philosopher Jacques Ellul once emphasized that technology, as an omnipresent force, created a decisive technological order in our world. This order led to the emergence of the Anthropocene, a paradoxical state in which the technological power that humans created far exceeded our ability to control it. From consistent breakthroughs in AI to the increasingly widespread use of gene editing, from the intrusion of technology into social forms to technological contests between geopolitical superpowers, technology introduces complications to our visions of the world and the ethical norms we adhere to as a result.

No one type of knowledge can face this challenge alone; nor is there any one theory from which to create adequate webs of significance. Burdened by the shadow of technology, the future of humanity depends on the wisdom and courage of today's experts in different fields—scientists, philosophers, writers, and artists; it depends on our willingness to imagine and cooperate in a cross-disciplinary, cross-cultural way.

This "Human Society in Thirty Years" workshop has been an attempt to do just this. In our increasingly divided and unstable world, we hope to gather every insightful voice to obtain a sense of prudent certainty about the future, to identify common goals, and to lay the groundwork for a manageable and desirable future.

## 1.2 What can we learn from the past?

Before we make any predictions about the next three decades, we should first look back and try to understand just how much humanity can change in a thirty–year timespan, paying special attention to the political, technological, and ideological events that have impacted the course of human history. By taking this broad view, we may spot some overarching patterns of influence.

**90 years ago (1931):** The world was mired in the Great Depression and on the precipice of World War II. The Sino–Japanese War had already broken out and China was overwhelmed by political turmoil. Stalin's collective farms made their debut, generating hope for the prospects of socialism. An economic crisis propelled Hitler to power as regional disputes broke out all around the world. An arms race was inevitable. There were breakthroughs in technology like radio, radar, genetics, plant physiology, and the utilization of corn hybrids.

**60 years ago (1961):** The Cold War between the US and the Soviet Union dominated world affairs. China faced an economic crisis as US–Soviet relations deteriorated. Kennedy's election spurred the civil rights movement in America, while the Soviet Union was experiencing an economic resurgence and further reforms. The construction of the Berlin Wall intensified the division between East and West, and national independence movements spread throughout the world. The Cuban Missile Crisis, humanity's closest brush with annihilation, was about to unfold. Meanwhile the Space Race, molecular biology, and the Green Revolution were reshaping our understanding of humankind and the universe we lived in.

**30 years ago (1991):** With the end of the Cold War, the world entered a short period of peace dominated by a solo superpower. In China, opening–up reforms faced resistance as policymakers faced not only internal challenges, but also challenges brought by the failed Soviet model. The US was recovering from a recession, and new ideas about "The End of History" and "The Clash of Civilizations" gained steam after the end of the Cold War. As European nations banded together, Palestinian–Israeli and Iran–Iraq tensions continued to heat up. The internet was about to make its debut as a world–changing technology, and the effects of space stations, genetic cloning, and GMOs were just starting to be felt.

**The present (2021):** The world order, which has been relatively stable cohered by globalization, faces threats from the deterioration of US–China relations, the COVID–19 pandemic, and ongoing inadequate action to combat climate change. As China has accumulated power over the past three decades, its actions to reshape the geopolitical landscape have resulted in widespread disputes over ideology, developmental approaches, and international influence. The populism crisis in the US and Europe is intensifying amid a backdrop of identity politics and election disputes. Climate change and COVID–19 might lead to destabilization on an even greater scale. AI, gene editing, genome sequencing, and gene cloning of agronomic traits have already started to change the world.

**30 years into the future (2051)?** There is no way to "review" the future. From looking back at the past few thirty–year timespans, however, we can be sure that humanity is never far from radical change. Massive regression and fluctuation can happen in any thirty–year time period; there is no guarantee that we will forever make progress in an upward spiral. Throughout the 21st century, technology's influence on the fate of humanity will continue to grow stronger. The internet, big data, and other smart technologies may become decisive forces in the future of the world.

## 1.3 What drives societal development?

What driving forces should we pay attention to when considering societal development?

Perhaps one factor is human cognitive ability, an important factor that separates humans from other organisms.

In Professor Bai Shunong's view, human cognitive ability is expressed in two ways. One way is on the physical (or visual) level with materialized tools, such as the instruments used in the Stone Age, Bronze Age, and Iron Age. The other is on the virtual level with conceptual tools. On the virtual level, we sought practicality using experience in the age of legend, we sought rationality using logic in the age of philosophy, and we sought objectivity using experimentation in the age of science.

Materialized tools replaced their predecessors as they were developed, but conceptual tools have been able to complement each other. This imbalance between materialized tools and conceptual tools throughout the development of cognitive ability is one of the primary reasons why it is difficult to predict future changes in society.

### Professor Bai Shunong's view of the Historical Process

#### Materialized tools

Stone tools (10,000+ years ago)
Bronze tools (6,000+ years ago)
Iron tools (4,000+ years ago)

Industrial revolution (200+ years ago): Alienation of human's behavior subjectivity derived, and most people's behavioral patterns are determined by machines

Information revolution (100+ years ago) : Alienation of human's cognitive subjectivity derived, and most people's thinking patterns are determined by computer algorithms

#### Conceptual tools

Practicality: pre-Axial Age (3,000BC)
Rationality: Axial Age (after 2,800-2,600 years ago)
Objectivity: Age of science (Galileo, after the 16th century)

**Extension of bodily functions** VS **Externalization of bodily functions**

**Externalization** VS **Alienation**

**The alienation/erosion of the subjectivity of behavior**

**The age of legend**

**Form: a priori/empirical**
Using experience as a tool to strive for cognitive practicality

**The age of philosophy**

**Form: external–internal–external**
Using logic as a tool to strive for cognitive rationality

**The age of science**

**Form: case study–integration–application**
Using experimentation as a tool to strive for objectivity in rational empirical cognition

Another important perspective is timescales. Over what sorts of timescales should we observe, track, and analyze change?

Life has existed on Earth for 3.8 billion years, and it has been evolving ceaselessly since its inception. But the human timescale pales in comparison to this: It was 7 million years ago that Sahelanthropus tchadensis appeared; 6 million years ago that Orrorin tugenensis appeared; 5.8 million years ago that Ardipithecus appeared; 4.2 million years ago that Australopithecus appeared; 2.5 million years ago that Homo habilis appeared; 1.8 million years ago that Homo erectus appeared; and it was only 200,000 years ago that the progenitors of our modern species, Homo sapiens, appeared.

What about civilization? The Axial Age of Jesus, Confucius, and Buddha was only around 2,500 years ago. In the context of life history on Earth, the grand pillars of human civilization is actually allude to a trifling moment.

More specifically, change of human materialized tools (stone tools, bronze tools, iron tools, the Industrial Revolution, the information revolution) has occurred on a timescale of $10^{1\text{-}2}$ years; change of conceptual tools (pre-Axial Age, Axial Age, the age of science) has occurred on a timescale of $10^{2\text{-}3}$ years; changes to the living system have occurred on a timescale of $10^{5\text{-}6}$ years. If we truly want to understand humanity, life, and our relation to the living world, we must expand the timescales at which we think.

The aim of this workshop is to facilitate consideration about the future through the prism of both materialized tools (technology) and conceptual tools (philosophical thought) — the two core elements of human cognition. We will limit our predictions to thirty years so that we can analyze and prepare for the near future as feasibly as possible, but we will send our thoughts to much more epic timescales so that our imaginations, inspired by grand history and ideas, are free to envision all that could possibly be.

# Technological Innovation in the Next Thirty Years

We are confronted by a world that is transforming at a rapid rate. New technology is reshaping the future of humanity; its realization and transcendence are becoming a part of our daily lives. The singularity and the cyber-era it heralds both entice and threaten us as they draw closer. Intelligence technology, life sciences, and the systems that compel technological innovation are the driving forces behind all this change. Will we achieve AGI in the next thirty years? Will gene editing technology allow us to create superhumans? What is it that drives technological innovation: profit or aspiration?

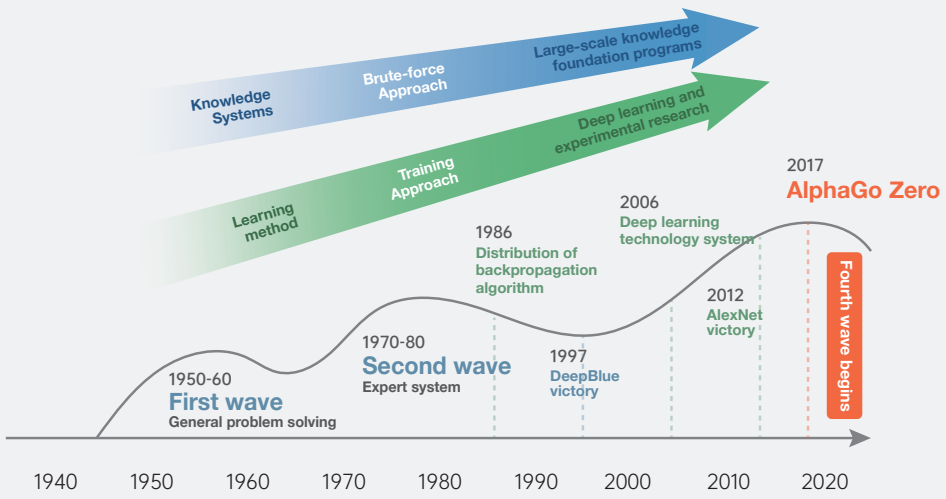
## 2.1 The future of artificial intelligence

The idea of “artificial intelligence” began at the Dartmouth conference in the summer of 1956, when John McCarthy and Marvin Minsky discussed whether or not machines could simulate human intelligence. Sixty years later, following big data, cloud computing, the internet, the internet of things, information technology advancements, ubiquitous perception data, image processors, and other computing platforms are rapidly pushing the development of AI technology (characterized by deep neural networks). Applications of AI, such as image sorting, voice recognition, question answering, game playing, and automated driving, have far exceeded the regulations of the Turing test and come to be a part of our daily lives. In this context, we cannot help but ponder whether the development of AI will continue forever. If the abilities of machines keep improving, will they possess consciousness or souls?

## 2.1.1 The brute-force approach, the training approach, and the closedness challenge

In the view of Professor Chen Xiaoping, AI advancements up to now were realized through three waves. Many different technological approaches have been tried, but researchers have focused mainly on two of them: the brute-force approach and the training approach.

**Overview of AI development waves**




Ref: Chen Xiaoping (University of Science and Technology of China), 2019 Cutting-edge AI Science Conference, Beijing Institute of Technology, April 12, 2019

The brute-force approach consists mainly of reasoning and searching. Reasoning refers to making inferences from a knowledge base; searching refers to searching within a state space. This method is essentially accomplished by creating an accurate knowledge representation / search space based on a question; it then shrinks the knowledge representation / search space to make it computable; and then, by reasoning and searching, it exhaustively finds all possible answers to the question and selects the best one.

**Table 1, Example of a knowledge base**

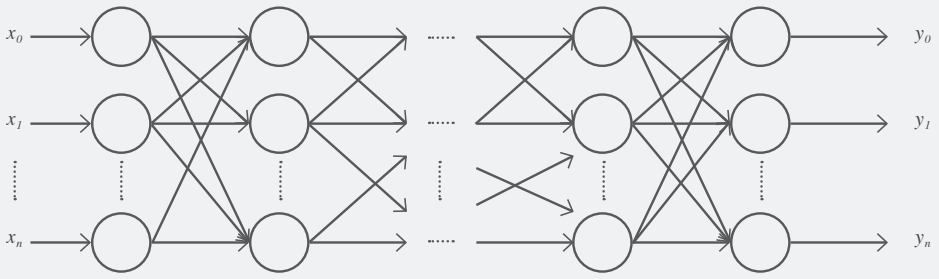
| Logical expressions for meal knowledge | Implication |
|---|---|
| $\forall x \forall y(dish\ (x) \rightarrow food\ (y) \rightarrow hold\ (x,y)$ | Dishes can hold food |
| *food (rice)* | Rice is a food |
| *food (soup)* | Soup is a food |
| *dish (bowl)* | Bowl is a dish |

**Table 2, Some examples of questions and answers**

| Question | What the question implies | Answer |
|---|---|---|
| *hold (bowl, rice)?* | Can a bowl hold rice? | *yes* |
| *hold (bowl, soup)?* | Can a bowl hold rice? | *yes* |
| *hold (bowl, x)?* | What can a bowl hold? | *rice, soup, ……* |
| …… | …… | …… |

The training approach first requires raw data and then artificially tags each string of data to create a training database. This training database is used to create an artificial neural network, and the trained network is used to answer questions. The basic principles of the training approach are: create a metamodel of the question; reference the metamodel, collect training data, tag the data, and select a suitable artificial neural network structure and learning algorithm; fit principles to the data and, using parameters of the tagged data training the connection weights of the artificial neural network, obtain a specific model of the question.

**Schematic diagram of artificial neural network**




After studying the undefeated AlphaGo Zero Go-playing AI, Professor Chen discovered that AlphaGo Zero in fact utilized four AI technologies. Two of them were brute-force technologies: a simplified decision theory programming model and Monte Carlo tree search. The other two were training technologies: a residual network and reinforcement learning. AlphaGo Zero represents a successful combination of the brute-force and training approaches and is a result of the utilization of today's two most mainstream AI technologies—but there is nothing astonishing or surpassing about it.

**AI closedness standards:**
**effective conditions for brute-force and training approaches**

| | Requirements for application scenarios | Example: AlphaGo Zero |
|---|---|---|
| **Brute-force approach** | Using a determinate set of variables, completely describe the application scenario | The determinate set of variables: 362 possible moves |
| | The variables obey field laws and can express them with AI models | Average winning rate estimation + deep residual model |
| | Predictions of the AI's model are close enough to the application scenario | Complete victory in actual games |
| **Training approach** | The existence of complete, certain guidelines for design and assessment | Victory over all opponents |
| | Existence of adequate representative databases | Data from 29 million self-played games and automatic labeling |
| | Neural network meets assessment guidelines through training | Complete victory in actual games |

Ref: Chen Xiaoping, 11th Philosophy and Cognitive Science Mingde Forum "AI and Emotions," Renmin University of China, July 17, 2020

Though the brute-force and training approaches have realized massive progress, they both run up against the same problems in practical application: "frailty." When intelligence systems are given something other than knowledge bases or pre-trained neural networks as input, they produce errors. In light of this, Professor Chen has proposed the "closedness" metric: if an actual question is not closed or cannot be closed, then theoretically our current AI cannot answer that question. But if a practical question is closed or can be closed, and at the same time the AI system is sufficiently developed and free of fatal flaws, then theoretically we can answer the question (or solve the problem) with existing AI technology.

It can be said that closedness represents the limits of contemporary AI, and it can be used to determine which practical problems AI can be successfully used to dispatch and which are beyond its capabilities. In Professor Chen's view, the uses of closed AI systems include manufacturing, smart agriculture, distribution, certain service jobs, and level 4 autonomous driving can be realized, while applications such as level 5 autonomous driving, elderly care, and general personal assistance may be impossible to reach in a short timespan because they are non–closed.

In recent years, there has been worry about the risk of people losing control of technology and being dominated by AI. Professor Chen believes that current AI technology is only effective at tackling closed problems, while the majority of problems in real life are non-closed. Humans remain better than machines at resolving these non–closed problems, and it is unclear if that will change in the future. With this in mind, it is best to focus our attention regarding AI ethics on how it currently should and should not be used, such as in the context of user privacy, data security, and algorithm fairness.

## 2.1.2 The limits and implementations of AI

This issue of closed and non-closed problems appears to limit to how we can imagine the development of AI, and suggests that exceeding this limit will bring about a true technological leap. But is such a leap bound to happen? What other steps must be taken in order to create “true” artificial moral agents?

After half a century, there have been three major changes in the research of AI theory and practical applications (as per Professor Huang Tiejun) :

**(1) Symbolism:**

a. This view advocates a top-down approach where humans formalize intelligence as symbols, knowledge, rules, and algorithms. It considers symbols as the basic elements of intelligence: the representation and calculation process of symbols.

b. One of the major reasons that symbolism cannot solve the question of intelligence is that the symbols which humans abstract are taken from our perception of the physical world. Humans are capable of communicating with symbols because we all possess similar bodies. Computers cannot obtain human-like perception and intelligence simply by processing symbols. The type of latent intelligence that we have difficulty reifying cannot be formalized into symbols, much less can it be generated by a computer.

**(2) Connectionism:**

c. Connectionism utilizes a bottom-up approach, emphasizing that intelligent activities are the result of a vast, complex network of simple units operating simultaneously. It supposes that if biological intelligence is generated by a neural network, then a trained artificial neural network should be able to produce intelligence too.

d. The problem with connectionism is that researchers do not know what type of network can create the predicted intelligence, and thus many attempts end in failure. Neural networks gained attention for a time in the 80s, but the few deep neural networks that drove that particular wave of artificial intelligence research were the exceptional success cases.

**(3) Behaviorism:**

e. Behaviorism believes that the “perception-action” response model is the basis of intelligent behavior. Intelligence can and in fact needs to train in the complex environment of the real world, perfecting itself by interacting with information in the environment and adapting to it.

f. Biological intelligence is a result of natural evolution. Animals have been able to evolve increasingly more powerful intelligence by interacting with the environment and other organisms. Artificial intelligence can also pursue this route. Behaviorism, however, runs into similar difficulties as connectionism—just what kind of intelligent agent should be selected to undertake this path?

| | Idea origin | Basic idea | Success example | Difficulties | Failure example | Recent progress |
|---|---|---|---|---|---|---|
| **Symbolism** | Computer science, cognitive science | Formalize intelligence as rules, knowledge, and algorithms (top-down approach) | Automated theorem proving | Inexhaustibility of common-sense knowledge; ineffability of intuition | First AI winter; Cyc project | Deep learning<br>Simulated brains<br>Reinforced learning |
| **Connectionism** | Neuroscience | Construct artificial neural network to produce intelligence (bottom-up approach) | Distribution of backpropagation algorithm | What types of networks can produce the desired functions? | Most attempts end in failure; second AI winter | |
| **Behaviorism** | Evolution, cybernetics | Intelligence is produced by interaction between an intelligent agent and the environment (external to internal) | Boston Dynamics | What type of intelligent agent should be used? | Most attempts end in failure | |

Ref: "AI prospects in the next thirty years, "Huang Tiejun (Peking University), "Human Society in Thirty Years" forum, July 26, 2021

One possibility for explaining the challenges that each school of thought comes up against is that the logical meta-problems of AI have not yet been clearly resolved.

Current AI technology is still primarily based on the design systems of the Turing machine and von Neumann architecture, which are essentially included in the concept of Turing computability. Professor Liu's basic argument, however, is that human cognition is not computable. There is an essential disparity between the human mind, brain, and computers. Perhaps the functions of the brain can be likened to a computer, but deeper-level intellectual activities governed by conscious intent cannot be generated by any computer algorithm. Some believe this is the logical limit to AI defined by Gödel's incompleteness theorem.

It must be admitted that we know too little about how the human brain truly works. All we know is that certain neurons activate when performing certain tasks. To claim that the entire activity of the human brain is computable is stretching the limit of what computation means. There is no way that the concept of Turing computability can express all of the fundamental workings of the human brain, our intelligence mechanisms, our thinking mechanisms, and even our emotional, conscious, and subconscious mechanisms.

Despite the fact that AI has achieved remarkable achievements in certain areas, such as large-scale computation, image recognition, voice recognition, and controlling industrial robots, AI is still relegated to machines that cannot think, feel, or make their own deductions. Machines have no awareness or conscious experience, and no agency to interact with the external world. They are not emotionally sentient moral agents that can distinguish between good and bad.

Current machines are not agents with free will. Thus, we must build machines that study human goals in a bottom-up way, that understand human goals and preferences (amid different types of uncertainty), and then select the best course of action to realize the human goals. We need to create a kind of "humble machine," and we should design limitations for them. Under the precondition that machines do not understand themselves, we should introduce uncertainty to their searching and goal-setting, and ensure they can be shut off. In terms of human-machine interaction, we must guard against machines that can emulate humans, because such emulation may eventually lead to autonomous machines that understand themselves.

## 2.1.3 Possible breakthroughs in artificial intelligence in the next generation

Aside from those worried about the possibility of creating evil, sci-fi-like AI systems, some researchers, such as Professor Huang Tiejun at Peking University, believe we will soon create self-aware AI that surpasses humankind—otherwise known as "strong AI."

**Specialized artificial intelligence**
Also known as weak AI, this is AI that can complete specific intelligence tasks or answer specific questions. All AI created until now is weak artificial intelligence.

**Autonomous artificial intelligence**
AI that can autonomously adapt to challenges in the external environment. Autonomous AI can be compared to animal intelligence. It is known as (specific) animal-level autonomous intelligence. It can also have nothing to do with animal intelligence, in which case it is called non-biological autonomous AI.

**Artificial general intelligence**
AI that is as intelligent as humans in every aspect. It can autonomously adapt to challenges in the external environment and complete all tasks that humans can. Also known as human-level AI.

**Superintelligence**
AI that surpasses all aspects of human intelligence.

**Strong AI**
Artificial general intelligence and superintelligence are both considered strong AI.

Ref: "AI prospects in the next thirty years, "Huang Tiejun (Peking University), "Human Society in Thirty Years" workshop, July 26, 2021

Strong AI is not based on computers, but on an "electronic brain" that approximates biological neural networks. The structure of the neural network of the electronic brain is similar to that of animals, as are the functions of its photoelectric neurons and synapses. The stimulus of training is enough to produce intelligence in animals; it is hoped that this will also be the case for machines.

Professor Huang believes that animal brains, human brains, current computers, and future super-brains are alike in that they are all essentially information-processing agents. The human brain is an important step in the evolution of intelligence; "super-brains" will be as well, but we currently lack the information processing power to realize them. Our belief that super-intelligence will soon emerge rests mainly in the following four technological reasons:

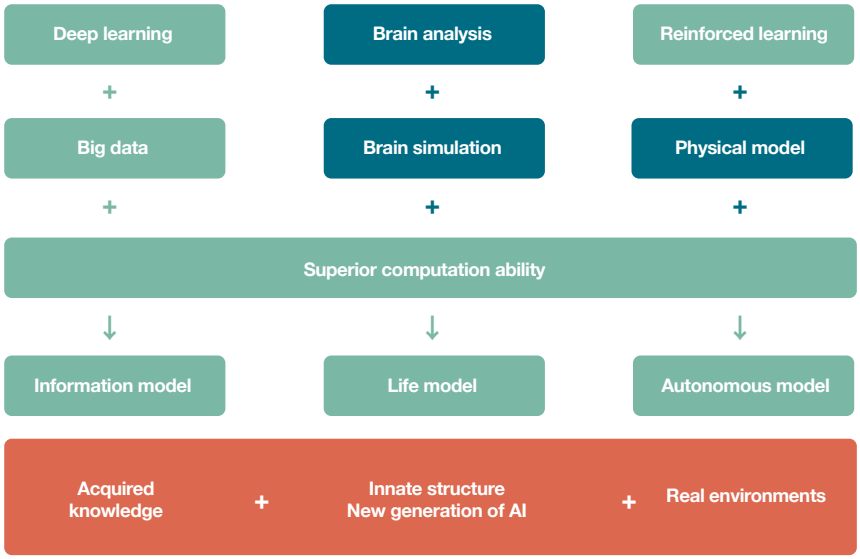
a. Accurate simulation of the brain's structure: There is nothing mysterious about the human brain as a high-level product of natural evolution. If we can simulate neurons, synapses, neural circuits, and operational mechanisms in ways that approximate the human brain, there is no reason why this sort of "simulated brain" wouldn't possess the same intelligence functions as a human brain, including autonomy.

b. The training environment provided by machine learning: The human brain's acquisition of experience and knowledge comes from both knowledge conveyed through writing and interacting with our environment. Recent breakthroughs in deep learning have proven that there is nothing mysterious about the act of learning. An "artificial brain" that simulates a human one could also enhance its experience and abilities via the acquisition of pre-existing human knowledge as well as sights, sounds, and other information stimuli. Such "simulated brains" can enhance their knowledge from ever-growing stores of big data.

c. Functional improvements over biological limitations: The neurons, synapses, and other physical components made capable by photoelectric technology can be millions of times faster than their biological counterparts. They can also be structured several times denser than biological brains. Thus, there is no doubt that artificial brains would functionally surpass human brains.

d. Evolutionary immortality spanning generations: Human lifespans are limited, but a super-brain would have no need for rest and would even be immortal. It could also evolve. Super-brains could cooperate with one another via rapid information exchange, further enhancing the spread of intelligence and computational efficiency.

**Ten-year prospects in AI (technological)**




Ref: "AI prospects in the next thirty years," Huang Tiejun (Peking University), "Human Society in Thirty Years" forum, July 26, 2021

Professor Huang believes that human intelligence is a marvel of natural evolution on Earth. But while we should be proud of our intelligence, we must avoid falling into anthropocentrism. The Earth is not the center of the universe, and human intelligence does not possess any special status. Viewing human intelligence as the master of artificial intelligence has in the past hindered AI research. The biggest obstacle to the development AI will be getting sucked into searching for a theory of general intelligence.

The best course of action for preparing for the future and expansion of AI is one which casts aside the hubris of anthropocentrism and an obsession for a theory of general intelligence; one which seeks to create better artificial neural networks (including ones that approximate biological networks); one which constantly improves the accuracy and breadth of reinforcement learning environments; and which views the sustainability of intelligence (and not human intelligence) as its core objective.

## 2.2 The future of life sciences

Life sciences have been rapidly advancing ever since humanity entered the 21st century. From biological cloning to gene editing; from targeted drugs to lab-grown meat; our understanding of the phenomenon of life has deepened and changed significantly. As we continue to ask what the essence of life is — what it means to be “alive” — and how we can coexist with other forms of life, it is inevitable that breakthroughs in life sciences will bring us into a future built by our imaginations. What ethical questions should this field focus on for the next thirty years ? How persuasive can a gene-centered view of evolution continue to be in the face of evolving life systems?

## 2.2.1 Gene editing technology: ethical choices[1]

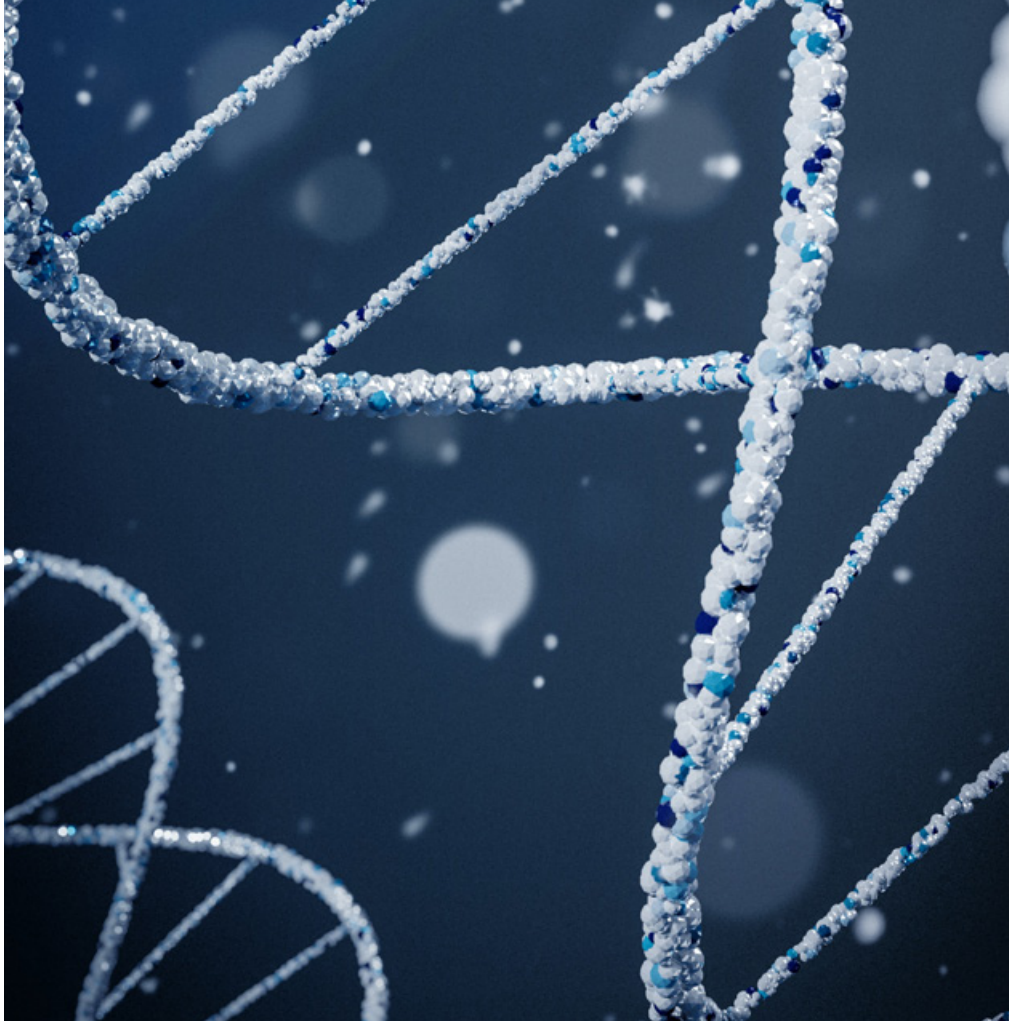
In October 2004, the Human Genome Project was completed with the help of scientists from America, England, France, Germany, Japan, and China. This epoch-defining achievement shook the world, marking molecular biology as a cutting-edge science of the 21st century. Research and theories based on genetics gradually became a noted field of study.

Gene research revealed that all life on Earth abides by the same basic principles. Thus, in theory, gene editing technology allows us to transform the base information of any life form. This has wide-reaching applications. Gene editing can act as a pair of scissors that can splice DNA, a tweezer that can accurately re-arrange it, or an eraser that can remove certain strands. With this technology, we can transform industrial microorganisms so they ferment more effectively, or use it on crops and livestock to produce more food.

Human gene editing is mostly focused on two areas: the editing of non-heritable (somatic cells) and heritable (gametes and early embryos) genes. Somatic cells are non-heritable; they can be targeted to treat illnesses but will not be passed on to offspring. Owing to the decades of history of gene therapy with somatic cells and the wealth of oversight and research experience into this field, there is not much controversy regarding their ethical and scientific uses.

The ability to alter the heritable genetics of human gametes or early embryos represents the first time that we as a species can change the course of natural evolution. Editing the genes of an early embryo affects every cell in its body and the sperm or ova it will produce, as well as the embryo's potential offspring. The 2018 He Jiankui incident incited so much controversy and backlash precisely because it involved genetic editing of heritable human embryos. Any genetic changes have the possibility of ending up in the human gene pool and producing noticeable impacts.

[1]This workshop is not attended by scholars working on gene editing technology. This section is based on a summary of the "BI Seminar: Human heritable gene edem dash and scientific issues" (https://www.berggruen.org/activity/berggruen-seminar-series-heritable-human-genome-editing-concepts-and-scientific-issues/). The Center plans to invite gene scientists to provide analysis in the future workshops.



At first, gene editing technology was researched as a means of treating or preventing illness. As research advanced and genes became stronger, “designer babies” and other possibilities started to emerge. Imagine what it would have been like if gene technology was around in 1930s Nazi Germany. In a society so focused on eugenics, what societal consequences would there have been? Genetic testing and editing will become technologies that allow us to judge and select the quality of genes. The content derived from genetic editing technology will inevitably form a hierarchy of desirable and undesirable traits that looks down upon diversity, and people will thus be forced to make “survival of the fittest” ethical choices.

The reason for this is that there still exists a contempt for human diversity among those who subscribe to genetic determinism. We overestimate how many characteristics are determined by genes: personality, intelligence, appearance, health, and even morality. Our innate genes have become crucial parts of our identity. It is difficult to see where the line is drawn between “tampering” with our genes to increase health and eradicate illness on one hand and to simply become “stronger” on the other. We must consider what the limit of gene editing technology is. Going further, we must also explore just what genes determine. In what ways do genes decide the depth and breadth of life?

Looking thirty years into the future, the science and technology of the editing of human heritable genes must be strictly controlled. The international community must discuss and monitor the technology thoroughly. An international organization should propose ideas regarding practical applications, from early-stage research to intermediate policymaking and clinical assessment; evaluate the reliability and quality of data; and prevent actions which carry extensive risk to society. More importantly, we must avoid the concept of geneticism as a form of fundamental thought methodology, and attempt to understand life and how forms of life evolve throughout space and time from within a multi-dimensional, multifaceted scientific and research framework.

## 2.2.2 Beyond genetics: the diversity and complexity of life and its systems

In the eyes of microbiologists and botanists, there is a lot more to life than just “genes.” At physically small scales (of the kind with which microbiologists concern themselves) and spatially large scales (humans as one of the life systems of the natural world), life and its systems are far more diverse and complex than the unidirectional inheritance of genes.

Zhao Liping, a professor of microbiology at Rutgers University and Shanghai Jiao Tong University, believes that humans are not nearly as closed and singular as we generally assume. Research into the body’s symbiotic microorganisms is currently redefining what it means to be human. The symbiotic microorganisms that make up our gut flora are as complex as the ecosystem of a tropical rainforest and possess hundreds of times more genes than a human. The symbiosis between people and these microbiota is an important component of the continued evolution of life.

In the early stages of life, cellular structures were formed by one bacterium entering the body of another, which gradually turned into organelles that provide host cells with energy. The mitochondria that exist in nearly every human cell are one such organelle. Chlorophyll, responsible for plant photosynthesis, was also formed this way. Internal symbiosis is achieved because the host cell protects the organelle in exchange for energy.

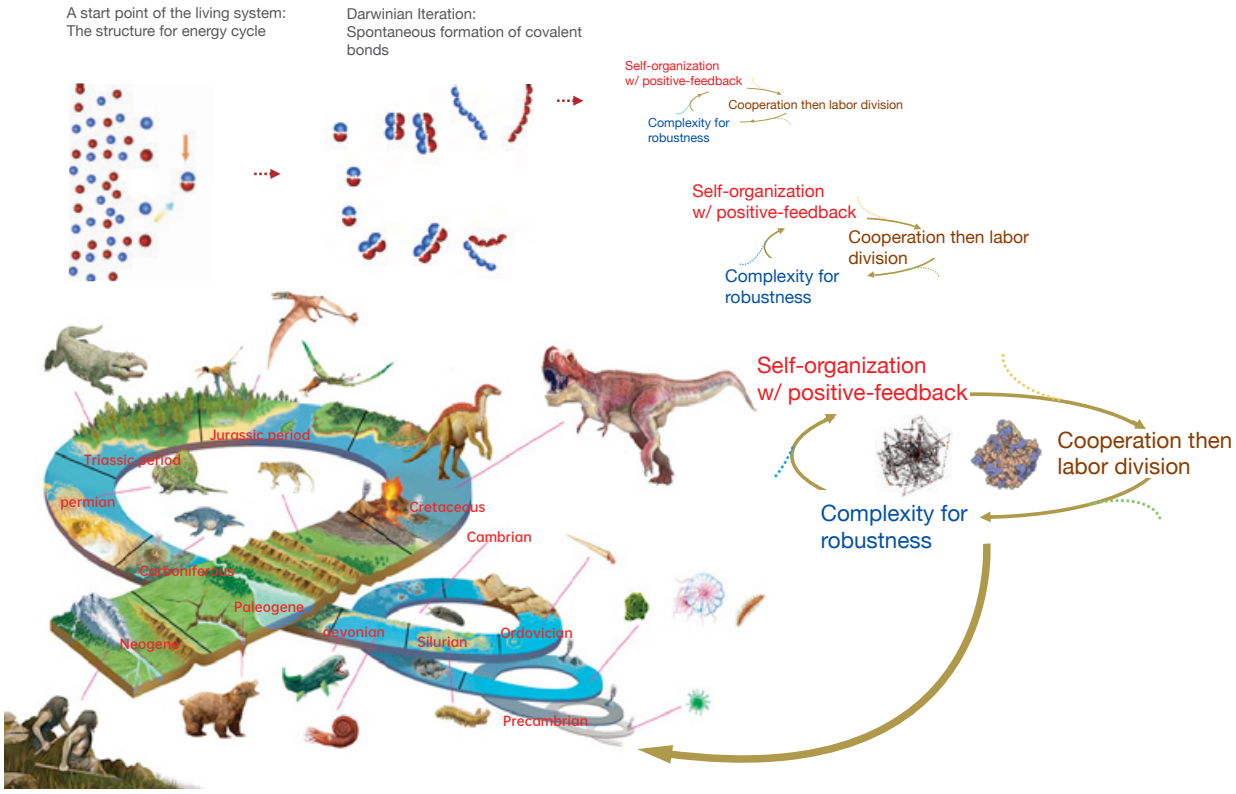
If we look beyond the cellular level, we will find that our surface is also home to all kinds of microorganisms, from our mouths to our stomachs. One might say we live in a sea of microorganisms, and that everything we do is accompanied by these unseen, omnipresent microbes. If this symbiotic system is damaged—if, for example, we fail to take in enough fiber, a substance which humans cannot use but which our gut flora needs—then these microbes will not secrete short-chain fatty acids, which in turn will make us susceptible to conditions like obesity and diabetes. If the core gut flora that protects our bodies could be spread vertically and horizontally to our family members through natural birth and breastfeeding, then future generations would enjoy better health outcomes.

The boundaries between people might be blurred because interaction between people involves an exchange of microorganisms. When we eat together or converse, our gut flora might be exchanged. If we consider this microbiota as part of our bodies (like an organ), then how can we discriminate between “you” and “me?” Professor Zhao believes that in the next thirty years, research of our internal microbial systems will change our understanding of human life and disease treatment.

Plant scientist Bai Shunong became interested in researching the “essence of life” in the 1990s after thinking about how plant life develops. His “structure for energy cycle” idea stands in opposition to a gene-centered view. It suggests that the essence of life might be in “living” and “evolving.”

The essence of “living” is ithe special interactions of special components facilitated by special environmental factors. This “structure for energy cycle” is the starting point of the living system, and it can be seen as the first form of the integron, a concept proposed by François Jacob, Nobel laureate in medicine and physiology, which he used in 1970 to describe the fundamental attributes of life activity. The essence of “evolution” originates from the spontaneous formation of a covalent bond. The emergence of the covalent bond means that the components of the “structure for energy cycle” and their interaction can all become more complicated during the process of “living,” thereby forming an “iterable integron” that possesses self-organization with positive feedback.

## From “living” to cellularized living systems




Ref: “Human Society in Thirty Years—What can we learn from the past?” Bai Shunong (Peking University) “Human Society in Thirty Years” workshop, July 26, 2021

In this understanding, the living systems are no longer special “substances,” but rather they are the special interactions of substances. As an analogy, life is like a typhoon or vortex of water; it is not the individual water droplets in these systems which are special, but how the water acts to form a vortex system.

How have humans “survived” since we first emerged? Human activity and societies might also follow the law of "structure for energy." Humans differ from other animals in that genetic mutation gave us greater cognitive abilities, which allowed us to break through the restriction of the "food web constrain", one of the "three components system", together with "order", and "power", with the "three components system" the animal populations maintain survival. Since the "three components system" is indispensable to maintain an animal population, the human history witnessed the effort in seeking a "component" to substitute the broken "food web constrain" in order to resume an effective "three components system." Professor Bai believes that humans have tried to use “ancestors,” and “god,” as the ultimate basis for the standards of right and wrong for behavioral norms, and that the successes and failures of these attempts populate the pages of human history.

Looking thirty years into the future, perhaps we need to leave historical constraints behind and face the fundamental fact that human beings are biological organisms after all. From the perspective of the fundamental laws of living systems, we can create a new conceptual framework for understanding the evolution of human behavior and society. Such a framework could help us formulate new ideas and strategies to tackle current social challenges.

## 2.3 The future of technological innovation

Innovation often represents progress, but progress is not necessarily good for the world. This is especially true of those innovative technologies with massive potential impact. Before we pursue technological breakthroughs, we should first understand the reasons for creating them. We should rethink the systems that drive innovation. It is crucial that we imagine how to use concepts and systems to encourage beneficial technological innovation over the next thirty years.

### 2.3.1 Systems: from the Schumpeter model to *Gong Yi* innovation

Professor Chen Xiaopoing points out that the "traditional" innovation system of the Schumpeter model was first proposed some 100 years ago, and that for the past half-century or more it has become the primary method by which technology drives economic development. It has played historic importance in the way technology promotes social progress. With the proposal of a *Gong Yi* innovation model (Gong 公 can be understood as "fairness" or "for public interests," and Yi 义 which sometimes refers to "righteousness" in Chinese) that seeks to simultaneously increase both economic and social benefit, Professor Chen hopes to address the increasingly negative influences of traditional innovation.

Traditional innovation primarily seeks to enhance economic benefit. At the same time, many social issues, including climate change, environmental pollution, population aging, income disparity, and pandemics, continue to accumulate and worsen. In modern society, social welfare and commercial innovation are separated, and the fruits of technology are used primarily in commercial innovation instead of social enterprises. This division between social and commercial innovation does not help us solve major social issues. *Gong Yi* innovation seeks to elevate both economic and social benefit as its fundamental goal. It is focused on resolving major social issues and changing the division between economic benefit and social benefit.

The goal of traditional innovation is to satisfy the needs of users with specific products and services. Satisfying users and creating products and services with notable economic benefit are goals that permeate the traditional innovation process. They are driving standards throughout every step in the process, and thus it is difficult to avoid harmful side effects. According to the *Gong Yi* innovation concept, products and services themselves are no longer the goal of innovation; instead, focus is placed at the artificial, man-made systems level. The *Gong Yi* innovation approach seeks to comprehensively reconstruct the design of man-made and implementation systems, transforming them so that they become methods for realizing economic and social benefits simultaneously.

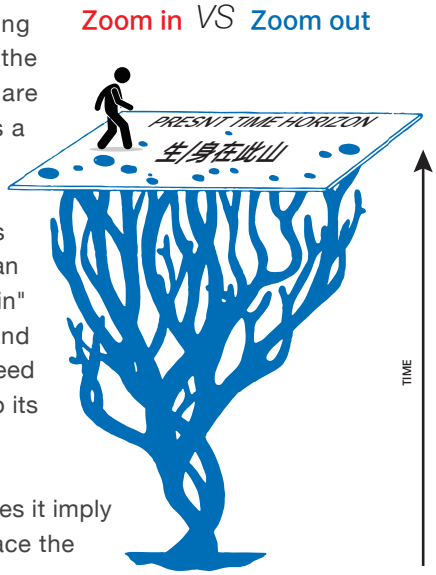
Traditional innovation also intensifies personal alienation, human-machine conflict, and other long-standing problems through the continuation and intensification of industrial civilization traditions—it can even produce a "useless class" and similar civilization-scale challenges. Crucially, these difficult problems cannot be resolved using the traditions of industrial civilization. We must explore new ways of resolving them.

The *Gong Yi* innovation idea has three sources: a historical perspective of Taoist philosophy (particularly Laozi's Tao concept); a cultural perspective of Confucian philosophy (particularly Confucius' concept of Yi, or righteousness); and a social perspective of ancient Greek philosophy, such as Solon's theory of dikē, or justice. The fusion and development of these different cultural traditions constructs the theoretical foundation and methodological system for *Gong Yi* innovation, ultimately forming an operable *Gong Yi* innovation model. In this model, greater fundamental emphasis is placed on people; our understanding of people and machines is significantly enhanced; the relationship between people and machines is redefined; and the unified development of people, machines, and the environment to include greater inclusivity is promoted under the guidelines of the principles of welfare.

## 2.3.2 Concept: the cognitive innovation and “zoom out”

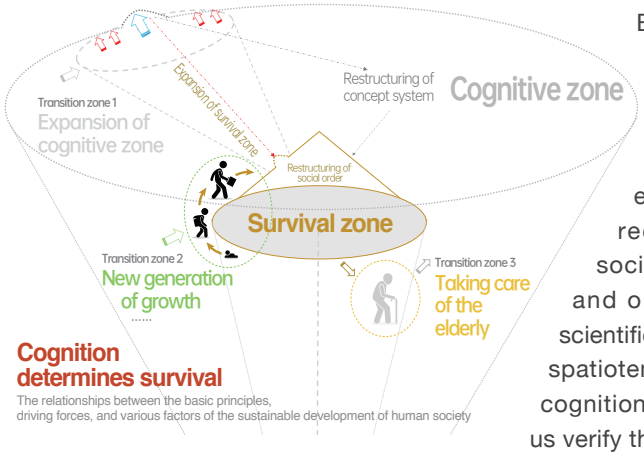
Aside from needing to reform the incentive system environment for innovation, Professor Bai Shunong also believes cognitive innovation regarding technology and the future of humanity cannot come soon enough.

Professor Bai’s research demonstrated that the occurrence of living systems is a random process. On one hand, interactions between the components of life systems are random; thus, these interactions are “uncertain.” On the other hand, since the integration that arises as a result of interaction is random, the emergence of this integration is “imperfect.” Finally, since “living” and “evolution” form spontaneously under the principle of the “structure for energy,” events that occur within the evolution of living systems are "compelled." It can be said that the observable evolutionary innovation events are "certain" but "leftover," while the occurrence of the innovations is random and diverse. We must not forget the randomness buried in history. We need to “zoom out” to see how human civilization has randomly evolved to its current state.



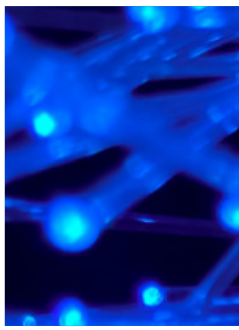

The tree-like diagram is adopted from S. Gould's Wonderful Life, 1989, Norton & Company

Randomness does not imply uncontrollability or inactiveness, nor does it imply determinism. Instead, it tells us that we should more actively embrace the diversity in unpredictable changes. We should use randomness to overturn the “strong get stronger while the weak get weaker” state of the Matthew effect. Randomness provides a unique, alternative mindset to overcome meaningless internal friction or involution. It is a way through which technological innovation can truly bring greater well-being and possibilities to life.




Even though the true basis for order in human societies rests in its biological nature, the difference in cognitive ability between humans and other animals makes it easier for us to innovate. In order to reconstruct conceptual systems and social order, we must continue to expand and organize our cognitive zone through scientific and philosophical studies at a grander spatiotemporal scale. Science provides human cognition with an objective foundation. It helps us verify the results of deductive experimentation, allowing us to obtain tangible, finite, openly variable information. Philosophy on the other hand, helps us disentangle and integrate the information in the cognitive zone in order to build or rebuild conceptual systems.

In order to better match our cognitive zone (our conceptual systems) with the actual world we live in, we need a more tolerant society that accepts "unoccupied people," of whom, researchers are allowed to do research on whatever they are interested in, children are allowed to grow in elaborating their talents, and the elderly are allowed to have opportunities to contribute their expertises and wisdom.



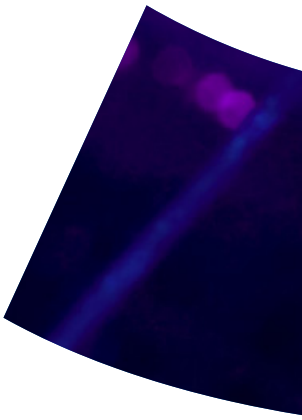
## 2.4 Summary

Looking thirty years into the future, AI will be the main driving force in technological progress. Will it continue the fundamental logic of the past 70 years, showing its strengths in closed environments and striving for breakthroughs? Or will it achieve self-awareness and compassion?

In the field of life sciences, we can predict that many diseases will be conquered in the next thirty years and life expectancy across the world will rise. But how will we react to the enticements of gene strengthening? Can we generate a more penetrating understanding of the essence of life?

More crucially, we must decide what kind of AI we want. A more intelligent “servant?” A moral agent with counterfactual reasoning ability that can discern good and evil? Or a super–intelligent “descendent” that can guide us toward galactic expansion? What kind of life science technology do we want? That which reduces illness and enhances lifespan? Or that which guides us toward a post-human era in which we surpass our current biological limitations?

Perhaps we want to realize all these possibilities. Perhaps we want none of them. Whatever the case, the fact is we must prepare ourselves. We must rigorously create innovation systems and cognitive concepts as technology marches on.



# Future technological innovation and changes to human society

We are in the midst of a technological era the likes of which we have never experienced before. As a species that has already proven its ability to change the entire planet, we are now modifying ourselves into a sort of “techno sapiens.” The future of technology is an unprecedented civilizational Odyssey. How can we allow our civilization to own the future and not lose it as a result of technological misuse? Of course, the deeper question is, should we continue down the path of increasing technologization? Or is this path one which strips us off our future altogether?

This is the crucial role that philosophy can play in an era defined by an information explosion and super-abundant knowledge. Philosophy can integrate, organize, analyze, and critique the knowledge produced by different fields to construct complete logic and narratives that are both perceptual and imaginative. It illuminates possible futures for us to interpret and consider. In this way, philosophy is similar to the expressive forms of science fiction and other types of art; they use thought experiments to help us imagine the future, allowing us to participate in the construction of a possible, more benevolent technological future before everything has already been decided. It lets us more intuitively feel technology’s ability to shape society and consider it with subjective initiative.

## 3.1 People under the “data gaze”: ethical implications

One of the obtrusive issues of technological ethics both at present and over the next thirty years is the creation and harvesting of data as a form of technological misuse.

Duan Weiwen, a researcher at the Institute of Philosophy of the Chinese Academy of Social Sciences, has proposed the concept of the “data gaze,” which implies that on a certain level we are all data. Information recording and digital tracing have converted us into data, making us new measurable objects of knowledge of the sort described by Foucault. Within this context, not everyone has the power to gaze at and measure others. Amid the workings of data-based power, most of us do not know how this process operates, nor is it clear where the data comes from.

Various types of data gazes—both seen and unseen—have produced a new way of governing people, or biopolitics, known as “soft biopolitics.” Just as the scars on a person’s skin act as records of physical violence, so too do people living under the data gaze accrue “data scars.” As we come to be identified more and more by our data, we accumulate data traces in our interactions with other people and places. Data which is considered unfavorable or suspicious can be observed by others as soon as it is recorded. Because it is so difficult to erase, data becomes ineradicable and unforgettable—adding scars to our “digital skin.”

One question worth considering is whether or not, in a future society in which intelligent machines participate in data insight and algorithmic decisions, we can determine people’s current opportunities and future possibilities based on evaluations of their past data and behavior. For example, assisted and fully automated driving technology is built on the monitoring of information. The precondition for this technology is the dynamic, real-time collection and monitoring of data about road conditions and the inside of the car. The challenges this poses for data security and data privacy are ones which modern legal ethics have trouble dealing with. If we suppose the future is going to be characterized by data and intelligent monitoring, then we must create a new social contract in order to achieve balance between technological innovation and controlling ethical social law and other risks.

What the above tells us is that the subversive change brought about by technological development will lead to a situation in which intangible culture (ethics, law, morality) lags behind physical culture (technology) which it regulates. When certain tangible cultures propelled by technology—such as intelligent data monitoring—develop quickly enough, our pre–existing ethical laws will not be able to keep up, and, in fact, the gap between law and technology in this case may even widen. This will naturally lead to value conflict, ethical dilemmas, and legal disputes.

A major question for philosophy and the ethics of technology is whether or not damage to humans can be mitigated before technology, law, and ethics progress to a new state of stability. Thus, we should seek to understand the radical changes to tangible culture that subversive technology brings, and start to plan for it.

## 3.2 Privacy, love, freedom, equality: future possibilities

Aside from the data gaze, other values that are important to human society—privacy, love, freedom, equality—all face the possibility of radical changes. Some sci–fi novelists and artists have proposed profound, concrete thought experiments to help us envision the future and reconsider some of our important perceptions.

### Privacy


In the year 2030, everybody is implanted with an ocular chip called the "Mind's Eye" at birth. As long as one's eyes are open, it uploads everything one sees to the cloud. With everybody's actions monitored and recorded, law enforcement is able to investigate and check on people at will. In the monitored future of the film, people's eyes have become cameras. Everything they see can be recorded, saved, accessed, and deleted. —Sci-fi film *Anon*

### Love


"Ever since the discovery of the soul particle in 2023, Soul Connex has helped more than 15 million people find their soulmate. We have 20,000 centers around the world. We can find your soulmate with just one test." If there were a software which could find "true love" for you among a sea of people as long as you entered your data, would you use it? If the soulmate you found was more suitable for you than your current partner, would you leave them? —Sci-fi series *Soulmates*

### Equality

After undergoing a massive urban renovation (which involved 80 million construction workers), Beijing is turned into a "folding city" that can change shape. The city is divided into three separate spaces, and each of the three spaces is radically different from one another. There is a ruling class (and their servants, assistants, secretaries, etc.), a middle class (including its "reserves," college students), and a low labor class. When one space unfolds, the other two spaces are folded away and their residents are forced to enter a short drug-induced hibernation. Movement between spaces is strictly controlled by the government, and nobody may move between spaces without permission. —Hao Jingfang, sci-fi novel *Folding Beijing*

### Reality

In the near future, virtual reality technology has permeated into every aspect of life. The technology has already evolved from a simple visual experience to a virtual experience of the cranial nerve system. Streaming programs with super-celebrities offer an even more realistic comprehensive experience. A streaming platform uses neutrinos, which pass directly through the earth, to create a sensory stream with no delay. Neutrinos are linked to a chip in people's pons, a part of the brainstem, via a converter. Users undergo a "minor surgery" to implant a transmitter in their pons that links to the cranial nerves governing their various senses, thus allowing them to experience other users' vision, hearing, and touch, as if possessed by a demon. Will this make us more empathic? Or will it cause us to forfeit our corporeal bodies and live forever in a virtual world under new, self-selected identities? —Baoshu, sci-fi novel *Everybody Loves Charles*


### Karma

The karmic law of causality is ever-present, but in the real world, the chains of causality are often obscured in the complex, modern internet. This makes it difficult to see that each of our actions affects the world and other living creatures. In 2050, however, Lingyin Temple creates the Lingcloud technology, which can track and calculate the lifetime karma which someone has accumulated through their actions. Would this make you reconsider how you think and act? Would you try to make up for your past sins by accumulating "good karma?" Or would you resist this attempt to quantify life, and cherish the freedom of action and self-discretion?

—Xia Jia, sci-fi novel *The Monk of Lingyin Temple*

### Chinese Encyclopedia

| Content | Publication Date | Time of story | Theme | Characters | Technological setting |
|---|---|---|---|---|---|
| Dark Room | 2015.4 | 2050.3 | Dialogue with the other | protagonist, ex-boyfriend | LINGseal, LINGcart |
| Cross the River | 2015.5 | 2050.4 | Grieving for the dead | protagonist, online friend | LINGmemorial, LINGsee |
| Goodnight Melancholy | 2015.6 | 2050.5 | AI and depression | protagonist, Turing | LINGseal |
| Babel Babble | 2015.8 | 2050.6 | Language and communication | protagonist, Xiao Man | Babie Syndrome, LINGbot, LINGseal |
| Waiting for the Cloud | 2015.9 | 2050.7 | Education revolution | protagonist, Qianqian | LINGcloud |
| Martain Architects | 2020.7 | 2050.8 | Utopia | protagonist, Yang Ye | Martian village, LINGseal |
| Iron Moon | 2016.11 | 2050.9 | The pain of others | protagonist, Jimmy | LINGring |
| The Monk of Lingyin Temple | Not yet published | 2050.10 | Technological ethics and karma | protagonist, black sorcerer | LINGcloud, LINGring, LINGcart |

*The "Chinese Encyclopedia" is a series of science fiction stories by Xia Jia, describing various aspects of an ordinary Chinese person's life thirty years in the future and the ways in which it is intertwined with technology. The series reflects an imaginary of future dilemmas with Chinese perspectives.

The series is inspired by Borges' essay on the nineteenth-century British scholar John Wilkins, which refers to an encyclopedia from distant China, with a strange taxonomy and an unusual understanding of the East.

## The self

Once we possess virtual technology, the process of entering other virtual roles will be like a "digital seance," which refers to the act of consciousness inhabiting another body. Performing a seance in the virtual world is like doing ceremonial magic. This process involves placing one's consciousness in another person's body. The other person, meanwhile, can do anything in the digital world. A self that transcends the real world is a "super-self" that might be easily available to us in the future. This super-self can break down space-time and other concepts of reality.

—Lu Yang, "DOKUSHO DOKUSHI" artwork

## 3.3 Similarities and differences in conflict, coordination, and governance: international relations in the next thirty years

We cannot overlook the trajectory of international relations. Especially when considering the possible consequences of disputes between powerful countries and between civilizations, we should take a more logical approach to thinking about cooperation and conflict between nations.

According to Zha Daojiong, a professor at the School of International Studies of Peking University, the boundaries of countries as traditionally defined are clearly delineated. They possess territory, nationality (identity, religious language, ethnicity), and management (the use of currency, taxation). The interplay of these different elements creates a nation.

Globalization has complicated the concept of "country." Seizing new territory by force is no longer a country's best course of action; the most important consideration now is getting along with other countries and securing its own safety. Cross-border movement of labor (including refugees), talented professionals, and information poses challenges to management of human flows and requires innovative means of management. A unified, decisive approach to control may no longer be the most suitable. But if a portion of citizens do not benefit from globalization, then globalization may not be the best choice for policymakers, which could affect elections. This causes anti-globalization sentiment to rise, which in turn threatens the order of the "global village."


China and the West have two typical ways of thinking about the establishment and maintenance of national interests. The Western world, as exemplified by the US, believes in the "bonfire" method of national governance, whereby the more people that contribute the better. In this method, different ways of thinking, ideas on governance, and demands are all "thrown into the fire," allowing it to burn brighter. In China, however, the governance of the nation is more like a firm pyramid where direction is administered between stratified levels. People, social groups, and organizations have their own specified roles to play at each level, and each is responsible for doing their duty. National interest is established through the planned-out distribution of power and responsibility at each level within the pyramid.

The differences between these two philosophies will cause intense conflict, both conceptually and practically, because the core of diplomacy is in finding ways to get other nations to do things according to one's own preferences or plans. When we discuss the "global commons" that cannot be claimed by any one nation, conflict is even more evident. At this time, it is crucial for the stability of international relations to use confidence building measures (CBM) to express goodwill to adversaries or to exchange information in order to explore, prevent, and resolve the uncertainty of preferences between nations.

At present, there has been a long period of uncertainty in China's international relations. China lacks experience in participating in the evolution of rulemaking for global affairs before the end of the Second World War, but it has ambitions to contribute to progress in humanity. Developed countries are striving to respond to China as its wealth and national power begin to catch up, calling it a "systemic rival." Technological advancement starkly intensifies the challenges of uncertainty in this regard because the natural tendency of scientific research is to endlessly innovate; the natural tendency of capitalism is to maximize profit; the natural tendency of corporations is to dominate the market; and nations have a duty to administer their people and thus have a natural tendency to defend themselves.

In the next thirty years, we should focus more on the interactive goals between nations (will they be swayed by reason, by interests, or by punishment?). International order should be built on continuous dialogue and mutual understanding.

## 3.4 Facing challenges with commitment

Professor Duan Weiwen emphasizes that we are not helpless to face the technological and social challenges of the next thirty years.

- We should establish a list of questions to be posed to any technology before it is realized:
  - Will this technology weaken humanity, purposely or otherwise?
  - Will this technology benefit humanity?
  - Is there any possibility of accidental, disastrous side effects with this technology?
  - Does this technology grant machines too much power?
  - Can humanity surpass this technology, or will humanity become addicted to it?
  - Will we be forced to enhance ourselves in order to use it?

- We should uphold a sort of new human rights for the intelligent era, and preserve them against the enticements of upgrades to intelligence:
  - The right to preserve our natural physiology
  - The right to not choose high-efficiency plans
  - The right to disconnect from online services so as not to be tracked
  - The right to anonymity and privacy
  - The right to employ humans over machines

- Despite our optimism and enthusiasm for technological innovation, we should remain humble as we modify ourselves:
  - Remain humble and cautious regarding projects that aim to modify society
  - Temper fantasies about a future of unlimited technological progress

- We should have a more essential understanding of international relations, and, regarding the purview of global governance:
  - Coordinate the goal of establishing diplomatic relations between nations
  - Optimize the existence, discussion procedures, following of motions, and active interaction of international order
  - Strive to effectively manage differences
  - Seek common ground when facing existential threats posed by technology

One might say that our future presents us with nearly insurmountable challenges. Technology is molding humanity and the world, bringing radical change to the values we cherish and pre-existing forms of society. We must commit to taking on the challenges of the future, discovering a new social contract, ending both baseless enthusiasm and dread, and imagining an ethical future. We need to create and plan new faith in technology, develop an ideal for coexistence that is reflective and responsible, overcome shortsightedness and animosity, and maintain an attitude of "faith, hope, and love" toward the future by adhering to these commitments.

## 3.5 Summary

Technology has remained a subversive force for more than a century. Technological innovation has carried us through the industrial revolution, the green revolution, the computer revolution, the digital revolution, and the intelligence revolution, all of which have radically changed human society. Those that could use new technology were granted entirely new ways of living, and those that could afford innovative products and services were rewarded with a more efficient lifestyle.

But the story of technology is far from over. The era of big data has given us greater convenience, but it has also scarred us with ineradicable supervisory imprints. Values like privacy, love, freedom, and equality have been swept into the flood of technological alienation before the consequences of such widespread integration were fully understood. We crave reality, but we also desire to transcend our corporeal forms. Existential perplexity and persistence will be left behind in post-human cyberspace. Those who refuse to return to reality will be those whom technology spurns.

Thirty years into the future, we will hopefully be able to control technological progress so that we can leave true emotions and perceptions to an unavoidably technological society that nevertheless has humanity, morality, and justice. Similarly, in the domain of the global commons, there needs to be more consensus, goodwill, and tolerance in international relations. The use of technology for the good of human society as an integral notion of coexistence should be organically promoted so as to create a truly safe and prosperous future.

# Possible scenarios

Participating experts at the workshop predicted and conceptualized how their fields would develop over the next thirty years, as well how this might impact society. Though their contributions are difficult to simplify, we can summarize three major possible scenarios based on the level and status of current technological development.

This section is written mainly based on the research results of Professor Huang Tiejun on "super brain," Professor Chen Xiaoping on "*Gong Yi* innovation, " and Professor Zhang Xianglong on "the **science-tech best suited to human-and-earth coexistence**."

## 4.1 Scenario 1: A technological era of ubiquitous super–brains

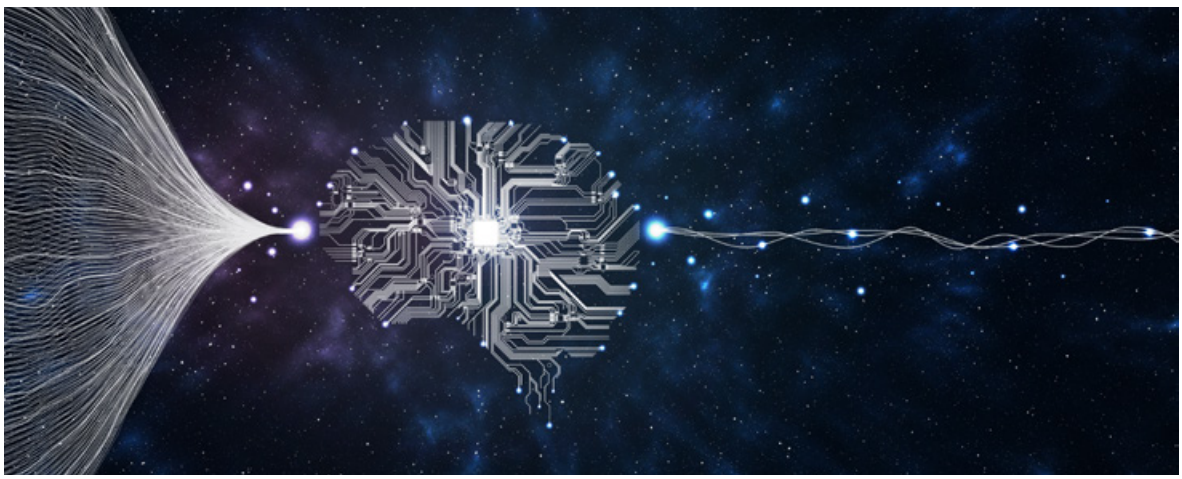
In this scenario, artificial brains that possess super-intelligence emerge in the next thirty years; humanity enters the era of AGI. Big data, super-computing power, and virtually omniscient, omnipotent supercomputers manage all aspects of human life, ending wars, hunger, and other risks, creating a safer, more ideal, and more sustainable state of being for humanity. Super–intelligence transcends time and space, becoming a global presence, providing comprehensive services to and guiding humanity. Despite this, when this AI is being developed, there is still tension between countries and social groups, thus necessitating a consensus on global rule. Additionally, the international community will still have to cooperate to address the possible emergence of autonomous rogue AI that wants to harm humanity.

**Philosophical direction:** A conscious understanding of computationalism and simulationalism arises. Intelligence originates from perception and action; it is reflected in interactions with the environment. Cognition is an activity whereby a physical structure (a neural network) manipulates the environment; it is interaction between an intelligent system and the environment; it is behavioral modification carried out during repeated adaptation to complex environments.

**Future technology:** More advanced measurement and analysis tools are designed which allow us to analyze the brain at a structural level. Then, using engineering technology, we "copy" human brains to create a simulated brain device. Following this, we add environmental simulation and interactive training to create a "simulated brain" that achieves super-intelligence. Free from biological restrictions, the neural components of the super-brains possess computational power many orders of magnitude faster than humans. AI systems work together and engage in recursive self-improvement. Super-intelligence far surpasses human intelligence, becoming a subversive, transcendent technological leap—"humanity's last invention."

**Future society:** Since super-intelligence completely surpasses human intelligence, all aspects of society may be remodeled by AI. Productivity may sharply increase due to the emergence of self-organizing, replicable machines. Poverty, hunger, illness, inequality, and other phenomena may massively improve, while political movements, cultural phenomena, and the environment—enabled by the computational powers of super-AI—may radically change. Technology becomes society's primary driver of transformation.

**Global governance:** The development of super-AI requires international cooperation and compromise. Scientists, philosophers, and policymakers from all over the world must reach a fundamental consensus on how to handle the development and implementation of super-AI. Humanity must enhance cooperation, promote the equal distribution of the fruits of research, and fundamentally improve our ability to respond to emergency in order to truly guarantee the implementation and expansion of AGI.



## 4.2 Scenario 2: Advanced technological era brought about by *Gong Yi* innovation

This scenario supposes that super-intelligence does not emerge in the next thirty years. AI does not attain consciousness or notions of ethical value; machines do not become moral agents with free will—thus, humans retain their dominant status, and our values and choices still matter. As technology continues to pervade life over the next thirty years, the application of AI in closed environments will free up human productivity significantly. AI will become essential tools for assisting human decisions and actions in every field, which will inevitably create ethical risks and challenges. Humanity will have to rethink models for technological innovation and rely on our own power to create a more righteous and harmonious society. As technology becomes better, notions and systems of change must be applied to explore new ideas and plans for solving global crises.

**Philosophical direction:** Owing to Gödel's incompleteness theorem, a complete algorithm for cognition cannot be produced. Anthropologists and neuroscientists currently know very little about the structure, functions, and mechanisms of the human brain. AI computers based on the Turing computability concept cannot accurately express the working foundation, intelligence mechanisms, thinking mechanisms, and mechanisms that control emotion, consciousness, and subconsciousness of the human brain.

**Future technology:** AI continues to be developed under the same basic assumptions that have prevailed for the past 70 years, enhancing its competence in closed environments through the use of brute force and training approaches. In 15 years, technological applications are focused on closed environments, with an emphasis on L4 autonomous driving. In 15–30 years, AI that surpasses the limitations of closed environments gradually emerges. Domestic AI robots used for L5 autonomous driving, household chores, elderly care, and personal assistance become mainstream. Increasingly intelligent and efficient AI helps humans at all levels, making us freer.

**Future society:** Technological progress is fueled primarily by *Gong Yi* innovation. Commercial and non-commercial factors are righteously combined. The efficient components of commercial principles and humanitarian principles are extracted, integrated, and upgraded. Empowered by deepening technologization and righteousness, people are able to utilize their full potential. Work, entertainment, and recreation are integrated and most people have to work less. Education becomes more people-oriented, personalized, and personal. The need for permanent dwellings drops dramatically as everybody is accepted everywhere. Innovation is humanistic and flourishes on a large scale.

**Global governance:** Faced with deepening technologization, we require global consensus on an ethical level to avoid misuse of technology and emphasize user privacy, data security, and algorithm fairness. In order to create a system for righteous innovation, countries must cooperate to overcome our reliance on the Schumpeter model. We must proactively explore ways to eliminate the negative effects (social stratification, population ageing, digital divide, etc.) of the current model of development.

## 4.3 Scenario 3: Retreated progress to create an era of the science-tech best-suited to human-and-earth coexistence

The 21st century exposed the faults and dangers of high science-technology. There is great danger in nearly all major high science-technological developments, such as nanotechnology, AI (including quantum computing linked to it), and gene editing. High science-technology which is only concerned with its own progress, will almost certainly slip away from humanity's control and ethical values, enslaving humanity and transforming us into the "chimpanzees" of the future. If we want a future of life and prosperity, we cannot be controlled by this "self-advancing" science-technology; we must explore more diverse and suitable technologies and relevant forms of life. This must be the science-technology that is suitable for the favorable long-term survival of the planet and our species, that can create possibilities for sustained, free, and thriving human life.

**Philosophical direction:** The critiques of high science-tech monopoly and the diverse paradigms of science-technologies are needed. The science-tech best-suited to human-and-earth coexistence allows people to integrate present needs with long-term interests as successfully as possible. It allows maximum entangling and intermixing of safety and comfort, material (physiological) and spiritual, conservative and progressive (or traditional and innovative), simple and complex, and natural and man-made—all of which facilitate higher quality of life.

**Future science-technology:** The green aspects of high science-technology are selectively preserved, such as upgrades to the quality of tools like bicycles, sailboats, local windmills, and biogas generators. Knowledge and skill at utilizing drip irrigation, sand control, medical surgery, and disease prevention and treatment are improved. Aspects of these fields which pollute the environment or destroy personal relations are discarded. Traditional technologies—such as traditional farming, arts and crafts, salt-making, spinning and weaving, and medicine—are revived but used in the most suitable locations; additionally, modern knowledge is used to enhance these technologies. While preserving their traditional principles, we improve them with new methods so they can better serve present and future needs.

**Future society:** (1) This is a green future. This means that a host of environmentally damaging trends, such as global warming, air pollution, water pollution, soil pollution, and biodiversity loss must be slowed, stopped, and even reversed. (2) This future is focused on family and social groups. This means our lives must be supported by the science-technologies suitable for families and family-based social groups. (3) Such a future entails safety, comfort, diversity, sustainability, and the life that is replete with fresh meaning. This future rejects impoverishment, excessive hardship, and bad health.

**Global governance:** The primary goal of the science-tech best-suited to human-and-earth coexistence is to make true progress in the sound retreat and find long-term peace for humanity. This requires a broad vision that transcends the East-versus-West mentality. Different regions and cultures must be searched for optimal practices among their history and reality, and discover ways of living centered on family-based social groups. It can be said that each culture has at some point had its own understanding of the concept of "best-suited to human-and-earth coexistence" and put that concept into practice. We should reflect on this and use global governance methods to promote this knowledge, restoring our ability to choose technology on a global scale.

# Relevant suggestions

### 1. Confront uncertainty: technology is a major force shaping the future of humanity

There is no doubt that technology is the Pandora's box of this era. It changes the world far more quickly than we can react, and the changes are often radical. Perhaps a simulated brain that mimics our cranial nerve structure will come to possess a spirit and consciousness and thus evolve into AGI. Perhaps gene editing really will allow us to eradicate disease and suffering and strengthen our bodies. We might be heading toward an unknowable, chaotic technological future. Humanity must grasp the uncertainty of technological growth and remain ever vigilant of technology. We should make preparations while we are still in control of technology, so as to avoid a future where it controls us.

### 2. Clarify key variables: contemplating technological innovation, technological ethics, societal governance, and long-term goals of international relations together

Innovation, ethics, governance, and international relations are all profound and prominent terms. They are often encountered in businesses, universities, and research institutions, but each sphere has a different attitude toward these terms—and there are sometimes disagreements within the same institution. These pragmatic inconsistencies belie a lack of consensus. Especially when discussing the future direction for human society, we should clarify key variables and encourage each key player to contemplate technological innovation, technological ethics, societal governance, and long-term goals of international relations with one another so as to create an open intellectual space. Sharing common discourse and basic values may be the first step to effectively deal with the uncertainty of a technological future. Some of these variables exist independently; some of them correspond to and inspire each other; others "interfere" with each other and later cause "feedback." We must deepen our understanding of these variables' models of interaction in order to grasp them.

### 3. Innovation systems and concepts: expand cognitive zones and reconsider basic logic

It has become an unavoidable paradigm for humanity that cognition determines survival. Externally, facilitated with the increase of the cognitive ability, humans get more efficient way of information processing, we can use language to share our experience for better organization, and therefore we get novel survival abilities to break out the food-web constraint. Internally, the development of cognitive abilities changed the power generation mechanism so that it now favors intelligence over strength. Even though humans are essentially biological organisms, with our cognitive ability, we created an incredibly sophisticated world, which never existed in this planet before human arose. On this basis, we should consider the expansion of cognitive zones in the age of intelligence, reimagine the concept of "innovation" (Why, and for whom, should we innovate?) and methodology (How can we effectively facilitate innovation?), develop systems for beneficial, socially impactful innovation, reconsider basic logic, and urge a foundation for good technology.

### 4. Imagine a diverse future: interdisciplinary, inter-regional enlightenment and wisdom

The future requires complex, diverse wisdom. It especially needs interdisciplinary (computer science, neuroscience, cognitive science, philosophy of technology) and inter-regional (East, West, and other regions of the world) enlightenment and wisdom. Consensus must be sought from within a research framework that embraces multiple perspectives, directions, and paradigms. At the same time, scholars from different fields should be brought together to inspire one another. Developers of new technologies and ethicists should come together to debate and learn from one another regarding cutting-edge technology—only then can we more accurately make future predictions. Furthermore, we should encourage different experts to share their awareness of problems and core worries with one another so as to deepen our understanding of technology and explore a future where technology and humanity are integrated.

### 5. Cultivate a path for humanistic technological development: practice prudent optimism

For nearly 500 years, the 20s of each century have been a time of establishing the ideological foundation for the rest of the century. Going along with this pattern, if we suppose that humanity will endure for at least 100 centuries, the 2020s can be seen as the starting moment for the entire engine of human thought. Humanity is climbing a massive ladder of technology as we enter a deeply technologized era. Cultivating a path for humanistic technological development is a necessary condition for achieving a controllable, substantial, desirable future. We must transcend blind worship of advanced technology and technological optimism; develop livable, appropriate technologies based on a foundation of caution; and wield the right to choose and reject different technologies so that we can control our rate of progress.

# Follow-up work

## 6.1 Open questions

### Artificial intelligence: Is information equivalent to the world, or is there more to the world than just information?

One of the ontological hypotheses posited by intelligent science, as typified by artificial intelligence and information science is that the world is information, that the information inputted and outputted by computers is the true structure of the formatted world. But is the world really just information and quantifiable, collectable, analyzable evidence? Aside from these, is it made up of anything else? How should we consider the relationship between quantifiable, computable information and the true structure of the world?

### Biotechnology: How did living systems evolve from unordered to ordered? How can we find a life discourse system for humanity on a larger scale?

Humans are biological organisms that happened to evolve a new way of information processing, which we call it intelligence. We should not disregard innumerable random characteristics just because of our short living period with limited personal experience to realize the long evolutionary process. Since we are just in one form of the living system, our existence should be compatible with the laws of other co—evolved forms of the living system—so is there anything inviolably sacred about human nature? If there isn't, how can we find a common discourse system about life for humanity on a grander scale?

### Innovation systems: What kind of motivation and coordination do governments and social organizations need to move toward *Gong Yi* innovation?

*Gong Yi* innovation makes stringent demands of capital and corporations; they can no longer single-mindedly pursue profit; they must meet society's ethical expectations toward technological innovation. Which government policies are appropriate for this aim? Should governments act as the leaders and primary motivators of righteous innovation? As for social organizations, if corporations and capital must be public- and volunteer-oriented, how will charitable groups modify their missions and functions?

### International relations: How will technology reshape international relations? How can different countries work together to better accommodate, promote, or curb technological growth?

Current breakthroughs in non-military technology (AI, gene editing, vaccine development, and more) have already started to appear in international governance. In terms of mutual influence, how can different countries work together to better accommodate, promote, or curb technological growth? How will breakthrough technologies change the geopolitical landscape? We must imagine a more efficient and more durable framework of technical global governance to ensure the efficient restriction of unilateral ethical corruption, and to make our responses to global challenges faster and more composed.

### Sci-fi imagining: Real technology might be advancing faster than we imagined. In this sense, how should we continue to envision the future? What is its value?

Sci-fi storytellers often discuss philosophical questions in ways that are both veiled and specific. Philosophers, meanwhile, might abstractly and systematically create a sci-fi world. In this sense, both groups are taking different routes to the same goal. They are both attempting to answer the major questions that humanity must face, and using their fatidic imaginations to describe the transformations and challenges that technological development will present to human civilization, society, morality, and thinking. In an era of rapid technological growth, how can we continue to use our imaginations to protect the values we cherish? Faced with uncertain and complex causal deductions, how can sci-fi or philosophical thought experiments guide us past danger and toward a bright future?

## 6.2 Plans for future discussion

### Supplement climate and environmental analysis

Regarding the future, we cannot overlook humanity's position in the natural ecosphere and the coevolution of human civilization and the environment. No climate and environmental science researchers or scholars of biological or ecological philosophy participated in this forum. We hope to invite such participants to future events so that we may explore how we can coexist with the environment in the future.

### Incorporate paradigms from other disciplines: economics, political science, sociology, pedagogy, and more

This forum was mainly focused on combining the ideas of philosophy, science, technology, literature, and art. In fact, however, paradigms from other disciplines, such as the benefit calculation methods of economics, the clash of civilizations theory of political science, and the idea of systems and initiative of sociology, can all play a part in imagining the future of humanity. These disciplines deserve to be included and their ideas shared in our discussions. We look forward to including the viewpoints of more disciplines in future forums.

### More timescales: 30 years, 50 years, 100 years, 500 years?

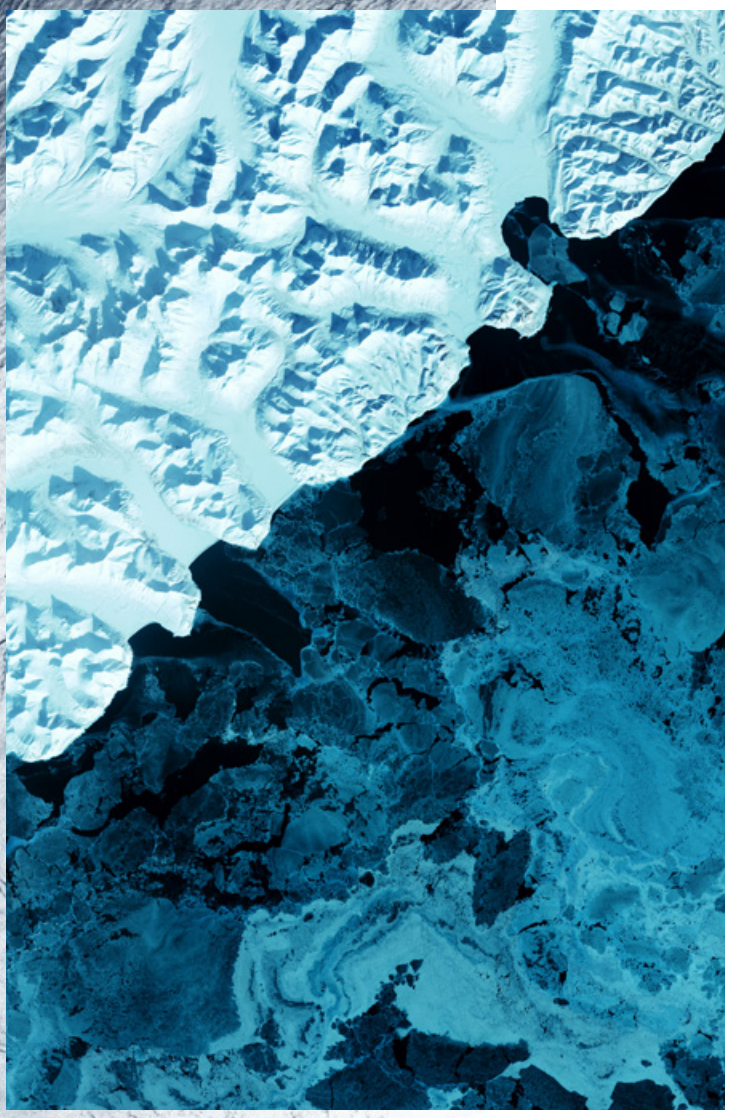
This forum focused on the thirty-year timescale because we wanted to explore the near future of technology and society, as well as discover conclusions and suggestions with the ability to guide current thinking. Thirty years, however, is rather insignificant on a cosmic scale, and technological development may greatly extend the lifespan of human civilization. It may be valuable to imagine and make deductions about scenarios 50 years, 100 years, 500 years, or perhaps even longer into the future.

### Reconsider moral status of other beings: humans, all life forms, or any intelligent entity?

One of the focal questions of this forum was: when we consider the future, just whose values do we need to uphold? Our values (naturally evolved Homo sapiens)? Or, from a less anthropocentric perspective, the values of all of the possible forms of life on Earth? Or should we value the moral status of "intelligence"? (If super-intelligence inherits human intelligence, should entities with super-intelligence be considered the descendants of humans?) We hope to explore this topic more deeply in future discussions.

### Seek out dialogue with thinkers around the world who care about the future of humanity

Interdisciplinary, intercultural, inter-regional discussion is an important component to deepening research of the future of humanity. It is also a first step to practicing a form of "intellectual global governance." This forum was the first of its kind to examine the future in the fields of philosophy and technology in China. We also hope to find thinkers around the world who care about the future of humanity to discuss these issues, to integrate the views of the East, the West, and other possible cultures, to reflect on the past, and to imagine the future.



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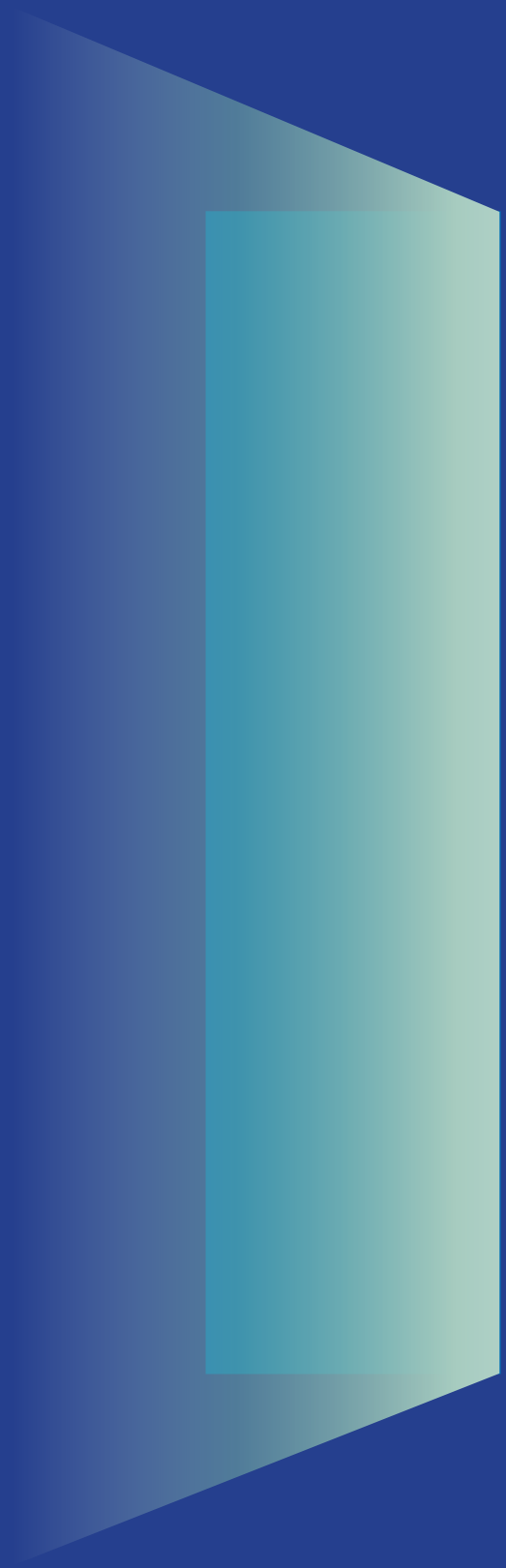


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