



# Designing for Future Life: Interdisciplinary Design Practice Beyond Biology

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**Abstract:** This paper takes “designing for future life” as its theme, and, based on design cases reflecting different scales and hierarchical levels, explores the essence of life through a cross-scale perspective, pays attention to biological dynamic laws, and takes these as the origin of design, continuously inspiring creative ideas and promoting innovation in design concepts and forms. This practice not only highlights a new direction for design practice in the field of art and technology, but also provides vivid examples for the integration of “biology” and “design”. These design practices construct unconventional worldviews and a generalized reality, using design works to challenge the boundaries of ontological existence, disciplinary domains, shared assumptions, and the limits between the possible and the impossible.

**Keywords:** bio-design, interdisciplinary teaching, innovative design

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## 1. The Symbiotic Relationship Between Biology and Design

The relationship between biology and design is a complex and diverse ecological relationship that has always existed throughout the long process of human development. It is Gilles Deleuze’s Rhizome, whose intricate network symbolizes the interwoven connections among elements without an absolute center; it is James Lovelock’s Gaia, which regards the Earth as a self-regulating living organism, in which humans, technology, and culture are all organic components; it is Jakob von Uexküll’s Umwelt, in which every existence has its own unique way of perceiving and experiencing the world, and the perceptions among different existences influence one another, jointly shaping the richness of ecology; it is Humberto Maturana’s Autopoiesis, emphasizing the self-creating and self-maintaining characteristics of living systems, where human technology and culture continuously generate and evolve within the broader ecological environment; and it is also Timothy Morton’s Speculative Ecology, which departs from traditional human epistemology and holds that there is no absolute center or dominant entity within ecosystems, and that all elements possess equal importance.

The School of Design & Innovation at the China Academy of Art, with the theme of “designing for future life,” responds to this symbiotic relationship through design practice. Against the background of the integration of life sciences and material ecology, it introduces biological thinking into design methodology, focuses on the philosophy of biotechnology and bioethical speculation, and catalyzes the artistic value of new life phenomena and organic manifestations. Through modules such as the “Micro-Growth Laboratory,” the “Bio-Computing Laboratory,” and the “Design Thinking Laboratory,” it completes practices including computational form generation, growth-based material synthesis, bio-intelligent manufacturing experiments, and the creation of artificial life forms. By designing new materials, inventing new species, and constructing new ecologies, it forms cross-domain collaborations to jointly explore the relationship between biological ecology and future life, and proposes future design propositions and visionary frameworks.

Within this ecological network of biology and design, we take biological diversity as a reference to view technological diversity, thereby creating ecological diversity in art and design. As the boundary between artificial and natural life becomes increasingly blurred, biology can help design expand the boundaries of speculation, while design can assist biology in exploring the meaning and attribution of ecology. Through the thematic practice of “designing for future life,” starting from understanding design humanities through biology, interdisciplinary design capabilities beyond biology are brought into play, realizing the value and significance of designing for future life. By employing design models with biological characteristics, ecological concepts, and life significance — such as micro-extraction, morphological variation, material recombination, and object generation — as ecological collectives that can be transformed across dimensions, dynamic and open possibilities for design innovation are provided. These works are grounded in design methods based on love, trust, cooperation, respect, and care, transcending the pursuit of mere functionality, and using design actions to envision the possibilities of future ecology, thereby constructing a multi-species vision of future ecological landscapes.

## 2. Understanding Design Humanities Through Biology

As the founder of sociobiology, Edward O. Wilson's major works include *The Origins of Creativity*, *Sociobiology*, *Consilience*, *The Future of Life*, and *The Meaning of Human Existence*. He broke through the typical perspectives of scientists in discussing issues. In *The Origins of Creativity*, the core ideas he proposed include the following: first, human creativity in the humanities and arts essentially originates from biological evolution; second, the essence and foundation of the development of the humanities and arts should be based on social functions rather than self-indulgence; third, both the humanities and the sciences are currently facing developmental dilemmas and need to influence and learn from each other in order to achieve breakthroughs. Wilson pointed out that in an era dominated by science and technology, where the humanities and arts are increasingly undervalued, it is necessary to find a clear path for their development. In fact, the current scope of the humanities and arts is quite limited, and there remain vast unexplored territories. From a biological perspective, the book explores three key questions: where does the creativity of the humanities and arts originate? What are the foundations and theories that support their development? Why should the humanities and natural sciences support and learn from each other? We need the assistance of science in order to understand design humanities.

The work *Teaching Fishing Rather Than Giving Fish* focuses on the increasingly severe problem of future ocean pollution. Based on speculative imagination, and through industrial research, future projection, and generative algorithms, it contextualizes future fisheries scenarios and designs a series of props related to future marine industries, helping us clearly recognize the consequences of the continuous deterioration of ocean pollution. Through this work, the designer hopes to invite more people from different fields to pay attention to and address the issues that truly need concern and resolution, so as to genuinely understand the relationships among humans, nature, and society, and to actively predict and respond to ecological changes.

For example, the work *Narcissus* reflects on consumerism and large-scale industrial production models in the context of today's "extreme anthropocentrism," discussing the relationship between subject and object within posthumanist discourse, and proposing a more idealized relationship between humans and their creations. At the level of material innovation, the work presents multiple possibilities of liquid metal as a new type of hybrid material; at the level of technological application, under the influence of different forming media and mechanisms, it integrates brainwave technology to control the generation of different forms; at the level of visual style, the aesthetic of future design appears more psychedelic and abstract, presenting a work full of infinite imagination.

The work *Plant Playground*, on the other hand, demonstrates a design approach that takes plants — rather than humans — as the design object and "target users." In the creative process, the designer shows a strong interest in plant intelligence, resulting in a work with a unique perspective, complete output, and engaging discourse. The work realizes a fluid relationship in which nature gives birth to humans and humans give birth to nature, which also reflects the "humanistic vitality" that design thinking should embody. Interestingly, this work has attracted considerable attention from many botanists, who appreciate this novel mode of thinking. This also aligns with the original intention of the design — to encourage people from different professional fields to come together and focus on the issues that truly need to be addressed.

## 3. Interdisciplinary Design Practice Beyond Biology

Design is no longer merely about the improvement of form, material, and color, nor is it confined to proposing immediate commercial solutions to address current problems, because we are fully aware that there are far too many issues that design alone cannot resolve. Design can serve as a humanistic means to bridge the gap between science, technology, and everyday life, enabling them to mutually create value, and fostering high-level dialogue to respond to the forefront of integration that we are experiencing. As a medium of exploration and a tool for thinking, design attempts to expose problems and concerns to the audience, inviting them to engage in discussion around the design object and to participate continuously. The iterative process of questioning and answering becomes a means of inferential evidence, giving rise to an advanced progression — from solving problems, to raising questions, and ultimately to calling for collective efforts to address the issues that truly need to be resolved.

For the development of biology-related technologies, design practice can provide interdisciplinary imagination that goes beyond the everyday. A study led by Japanese scientists, published in *Med*, a sub-journal of *Cell*, for the first time confirmed in human experiments that enteral respiration via the anus is safe and feasible as a medical technology. The work *Bottom Breather*, based on this scientific premise, envisions a future in which environmental pollution has become severe and the remaining oxygen on Earth is insufficient to support breathing through the mouth and nose. In the post-respiratory era, humans transition to using perfluoronaphthalene solution for assisted enteral respiration. The author conceptualizes a brainless organism scientifically named "Barrel Sea Squirt," whose respiration transports thousands of tons of carbon diox-

ide to the deep sea, generating a greenhouse effect and raising global temperatures. By utilizing its asexual reproduction and powerful liquid oxygen propulsion, a new organism called “Naphthoxy Tunicate” is cultivated to coexist symbiotically with humans, assisting in enteral respiration. In this scenario, bio-designed products based on enteral respiration allow people to absorb oxygen while simultaneously observing the propulsion-use “Naphthoxy Tunicate,” thereby forming an entirely new mode of social interaction.

Focusing on the adaptation of biotechnology for future survival, the work *Brain Star* turns its attention to the intersection of technology and culture. The author focuses on the development of neuronal calcium imaging technology and, through design practice, makes the visualization of neural activity possible. Through this technology, people obtain images and data generated from brain scans and share them on social platforms. Posting “brain selfies,” pursuing “beautiful neurons,” and fostering a trend of “visualized neural social interaction,” it ultimately develops into a fashionable cultural phenomenon. Based on attention to and discussion of this phenomenon, the *Brain Star* organization hosts a “neural beauty pageant” to evaluate neural aesthetics in a more systematic way. While focusing on presenting this future neural beauty competition, the work also reveals new possibilities for sharing and social interaction in the future, aiming to provoke reflection on the relationship among technological development, ethical norms, and cultural events.

The work *Double U* brings the perspective back to the increasingly prominent issue of population aging. With a gentle and cautious approach, it explores the potential integration of stem cell medical technology with the emotional needs of the elderly. The author designs a series of stem cell-derived products related to emotional bonds for future elderly individuals. The most moving aspect of the work lies in its refusal to make absolute predictions about the future lives of the elderly; instead, it conveys a rational and warm reflection: the future is unpredictable, and we cannot be certain what form the lives of future elderly individuals will take. Precisely because the future may change as a result of our predictions, our inquiries into the future of aging must be more cautious and inclusive, guided by kindness and compassion, tolerance and humility, and a sense of integrity in envisioning the most ideal and desirable future of aging.

#### **4. The Value and Significance of Designing for Future Life**

In recent years, the unexpected realities experienced by humanity have placed the entire human system in a situation marked by frequent errors. The illusion of everything being human-centered, along with the sense of superiority it generates, has instantly been called into question. The absurdity of daily life and the sense of powerlessness in design effectiveness compel us to repeatedly reflect, with courage, on innovation and breakthroughs in integrating humanistic care with science and technology. Rooted in the field of humanistic art and design, we extend an open approach toward other scientific domains, using design as a tool for thinking to engage with research in life sciences, biotechnology, new materials, and new substances. We call upon designers, scientists, and thinkers to jointly explore a “new design ecology” of the relationship between natural ecosystems and humanity, generating design insights into our real world and speculative proposals for unknown possible worlds.

The work *156°C* focuses on the extremely harsh future conditions of desertification and high temperatures, exploring whether humans can draw on the survival characteristics of other organisms and, through technologies such as genetic modification and stem cell cultivation, develop higher-quality organs and bodies better adapted to extreme environments, thereby preparing in advance for environmental deterioration. To realize this vision, the work extracts morphological and organ characteristics from various organisms that cope with desertification and high temperatures — drawing on the cooling principles of gill-like structures, the multi-stomach energy storage mechanism of camels, the elastic bladder function of water-storing frogs, and the fat-tail energy storage characteristics of jerboas. Combined with the principles of the human water circulation system, it proposes integrated modifications to human skin, stomach, bladder, and coccyx, creating multiple types of “new high-temperature-resistant human bodies” adapted to high-temperature environments at different altitudes. The core aim of the work is to explore the diversity and possibilities of how humans may respond to future survival challenges under new technologies and environmental conditions.

If *156°C* focuses on the interplay between nature and survival, then *Chili* shifts the perspective back to human society, using a sharp metaphor to expose the truth of food alienation in the age of consumption. Set against the backdrop of food shortages in 2050, the work envisions a chili-themed restaurant that uses gene editing as a culinary method. Through three strategies — altering the form of chili peppers, designing specialized utensils, and reconstructing complex consumption processes — it transforms the ordinary chili into a symbol of high social status. This directly addresses the reality that, under intensifying anthropocentrism, food has been alienated into a symbol of class power. Using this as an entry point, the work explores the deep relationships between humans and food, society and food, and humans and consumption, prompting reflection on what ultimately determines people’s standards for choosing food, and whether changes should be made in re-

sponse to the current state of food alienation. This line of inquiry carries strong contemporary significance.

The work ORG Bio-Laboratory presents a more striking expression, completing a profound reflection on the relationship between humans and nature. Inspired by the specialized digestive system — the ruminant stomach — of the Tana River red colobus monkey, the author designs and develops a series of “transplantable new human ruminant stomachs.” This new type of artificial ruminant stomach is capable of purifying different types of toxins, helping humans better survive in a future marked by severe food safety crises. By fully presenting the entire process of design, manufacturing, transplantation, and commercialization of the “artificial ruminant stomach,” the work conveys a central idea: humans should have grown in accordance with natural laws, yet due to past destructive actions toward nature, they must now pay the corresponding price, enduring the pain brought by unnatural bodily modifications. In doing so, it provokes deep reflection on the relationship between humanity and nature.

## 5. Conclusion

The purpose of these designs is no longer to pursue a perfect ultimate solution, but to speculate on the ecological forms of future evolution and use them as a medium to stimulate reflection. In an era of rapid technological advancement and a crisis of imagination, they invite more people to participate in imagining a multi-species future, preserving desirable and optional futures for us. While interpreting and explaining the development of new technologies and social transformations, these design proposals extract design insights into the real world through practices of aesthetic integration, and put forward everyday propositions and future visions that integrate biology and design. With a more composed and proactive attitude, they cultivate catalysts for the dreams of Chinese society and demonstrate a Chinese approach to design evolution in response to an entangled future.

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