2024年度活動報告書

EXTREME BIOLOGIES

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Overview

We find ourselves in an era marked by the convergence of biotechnological advances and human culture, a convergence that propels us into uncharted territories. The familiar Darwinian narrative, with its emphasis on biological evolution as the primary driver of change, now gives way to a narrative shaped by the currents of cultural values. We are navigating a "post-Darwinian era," a landscape where the evolution of life is steered not only by the forces of biology but by the intricate interplay of ideas, beliefs, and human agency. In the wake of this paradigmatic shift towards a "post-Darwinian era", this project explores the role of media art in relation to questions of evolution, ecology, global warming, pollution, coexistence, biotechnology and the presence of what we might term "extreme biologies."

Research on the entanglement of biotechnology, cultural values and evolution

The first year of the project was dedicated to exploring the intricate relationship between biotechnology and cultural values in shaping the post-Darwinian narrative. Students examined how this entanglement influences evolution and ecology, emphasizing the importance of interdisciplinary collaboration in understanding these dynamics. Beyond mere analysis, the project sought to actively engage with the evolving nature of life on Earth, recognizing that evolution is not solely driven by biological processes but is also profoundly shaped by cultural values, ideologies, and technological advancements. By acknowledging culture as an active force in evolutionary trajectories, we highlighted the complex and reciprocal interactions between human innovation and the natural world.

This project was structured in distinct phases, each focusing on research, collaborative activities, artistic production, and the dissemination of findings. As the project progressed, a series of lectures and group discussions provided a platform for exploring key themes, fostering interdisciplinary dialogue, and deepening participants' understanding of the complex intersections between biotechnology and culture. In particular, lectures and discussions were held on the following themes:

- Life in extreme environments
- The entanglement of biotechnology and cultural values
- Life from the history of reproductive technology
- Frankenstein
- Art in collaboration with animals and animal rights
- Cryptobiosis
- Extreme genetics

Fieldwork to collect moss and microorganisms

We searched, collected and studied different types of mosses where living microorganisms are active. The first fieldwork was conducted in Miki Park, Ogaki city. We specifically focused on mosses where water bears (tardigrades) and rotifers are frequently found. For example, cushion moss (Leucobryum spp.) and grimmia moss (Grimmia spp.). These mosses provide the necessary microhabitats for tardigrades to thrive by offering moisture retention, shelter, and food sources. Several fieldworks to collect moss and microorganisms were also conducted around Softopia Japan.

Water bears are water-dwelling micro-animals known for their incredible resilience. They can survive extreme conditions, including radiation, high pressures, desiccation, and temperatures ranging from near absolute zero (-273 C) to well above the boiling point of water.



Top: fieldwork to collect moss and microorganisms at Miki park, Ogaki city. Left: Fieldwork at Softopia Japan. Right: Working with moss samples at the laboratory.

Experiments with water bears and other microorganisms

Throughout the development of this project, extensive experiments were conducted with tardigrades, nematodes, and rotifers to better understand their unique characteristics. Using a range of microscopes, we closely observed these microorganisms, analyzing their bodies and behaviors while also learning the techniques required to culture them in the laboratory. The research placed particular emphasis on three species of tardigrades—Echiniscus japonicus, Milnesium tardigradum, and Hypsibius dujardini—examining their morphological traits and behavioral patterns. These studies provided valuable insights into their adaptability and survival strategies, contributing to a deeper understanding of these fascinating micro-animals.



Top: Image of tardigrades (hypsibius dujardini) under the microscope. Left: Observation of samples using different microscopes. Right: Studying the body and behavior of water bears (Echiniscus japonicus).



Left: Observing live tardigrades through a microscope. Right: Image of a water bear under the microscope. Bottom: Experiments with water droplets and micropipettes.

Exhibition of research activities at IAMAS OPEN HOUSE

In July, at the Open House, we organized an exhibition showcasing our ongoing research activities. Visitors had the chance to explore our work, gain insights into various artistic projects, and engage with students to learn more about our discoveries and experiments. Specifically, students presented the first results of their investigation in the form of concepts and prototypes. In addition, a diverse collection of moss samples was gathered and displayed for public viewing, offering visitors a glimpse into the fascinating world of water bears. Alongside these specimens, an interactive exhibit allowed guests to observe live tardigrades through a microscope. This hands-on experience provided an up-close look at these remarkable creatures known for their ability to survive "extreme conditions". The combination of moss samples and microscopic exploration created an engaging and educational experience, sparking curiosity about the hidden micro-wonders of nature.



Top: General view of the exhibition of the Extreme Biologies project at IAMAS Open House. Left: Image of the prototypes proposed by the students. Right: A collection of moss samples displayed for public viewing.

Cryptobiosis experiments

During the second semester, we focused on the phenomenon of cryptobiosis and performed several experiments with tardigrades in the laboratory. Tardigrades can survive almost anywhere, including being exposed to the vacuum of space and extensive radiation. But even more remarkable is that a tardigrade can lose all the water in its body and then come back to life. If you pour a few drops of water on a dried-out tardigrade, in a matter of minutes this tiny animal becomes a lively and feeding organism, even after 30 years of desiccation. This third state of existence between life and death that tardigrades are able to experience is known as cryptobiosis. In this state, tardigrades essentially shut down their metabolic processes and can endure harsh environments for extended periods, only to revive when conditions become favorable.



Top: Image of a tardigrade in its tun shape during cryptobiosis. Left: a collection of moss samples for microscopic observation. Right: Experiments with tardigrades focused on cryptobiosis.

Fieldwork at the Yokokura and Kengon temples

We searched and collected different types of mosses at the Yokokura and Kengon Temples in Gifu. At the Yokokura temple, we visited a shrine which has one of the oldest Buddhist mummies (Sokushinbutsu) in Japan. This term refers to the practice of Buddhist monks practicing asceticism to the point of death and entering mummification while alive. We discussed and explored ideas around this practice, resurrection and cryptobiosis.



Top: fieldwork at the Yokokura and Kengon temples in Gifu. Left: Collecting moss and microorganisms. Right: Image of one of the shrines at the Yokokura temple.

Oral presentations and exhibition of artworks

In the final phase of the project, students shared their findings through a series of presentations, discussing both their research themes and the prototypes they had developed. The culmination of their work was showcased in a private exhibit on the 12th floor of Softopia Japan, where they unveiled their projects to the project members. This exhibition served as more than just a display of their progress—it was an opportunity to materialize the concepts explored throughout the first year and to create thought-provoking works that highlighted the intricate connections between biotechnology, culture, and evolution. Through this approach, the exhibit invited reflection on the ever-evolving relationship between life, technological innovation and human culture.



Top: Exhibition of artworks on the 12th floor of Softopia Japan. Left and right: Images of the work "A magic lantern for meeting water bears again".