The science of envy: Bio-Robotics integration for understanding social emotions and achieving an inclusive society（The science of envy）

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Research Area Information	Number of Research Area : 22B306 Project Period (FY) : 2022-2024 Keywords : envy, theory of mind, social emotion, simulation

Purpose and Background of the Research

●Outline of the Research

Negative feelings arising from differences between oneself and others, such as gender, race and inequality, as well as communication difficulties arising from disabilities and aging, are hindering the realization of an inclusive society. If we can overcome these mental factors and communication problems, we can expect the development of a society where everyone respects and supports each other.

Envy, jealousy, and unfairness are all negative emotions that arise from relative comparisons between oneself and others. They have much in common in terms of related emotions, cognition, and behavior, making them important brain functions that form a theory of mind. Here, we define these negative emotions as 'envy' in a broad sense, and aim to investigate the underlying mechanism of 'envy'.
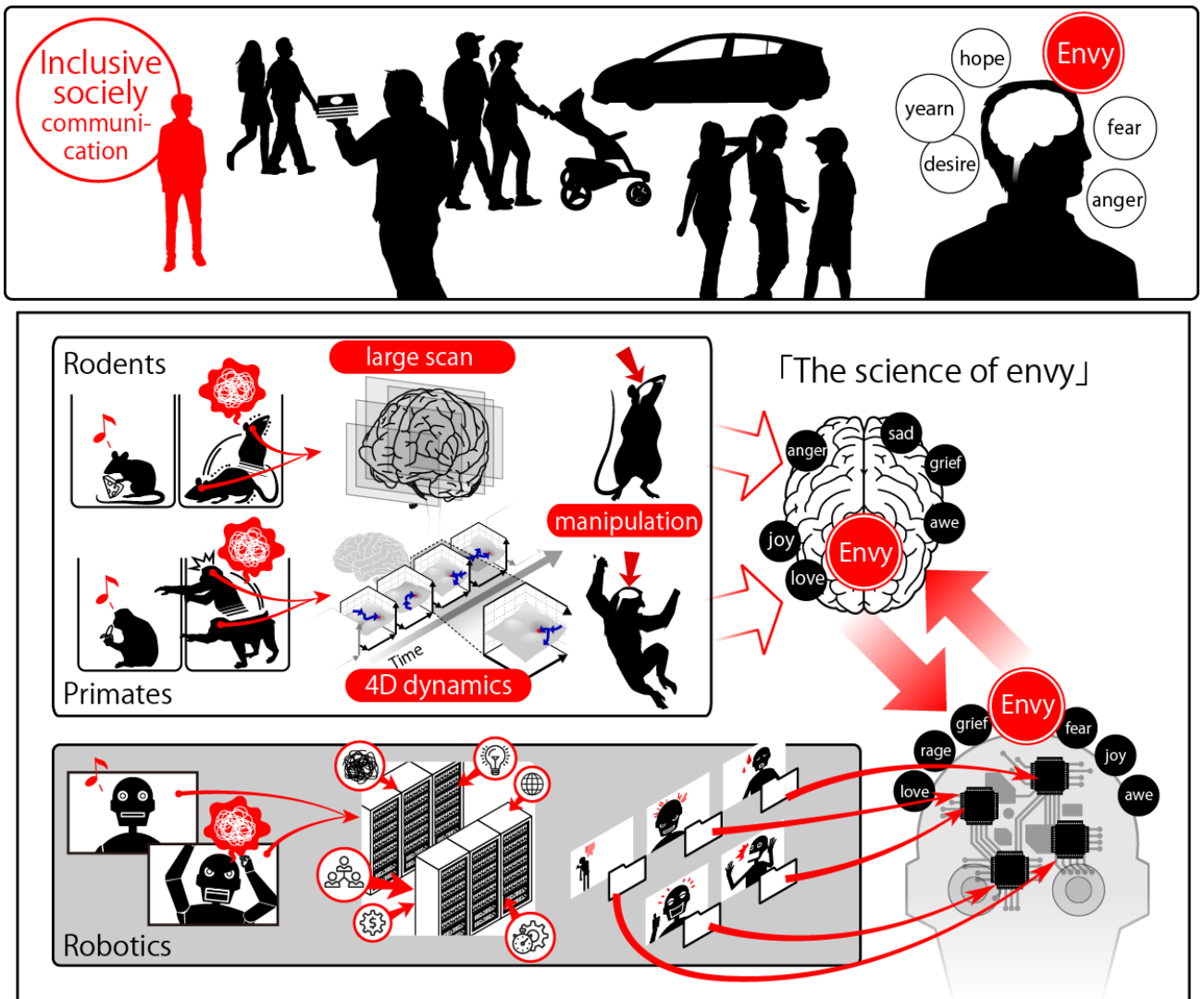

Figure 1. An outline of this transformative research areas (B)

●Content of the research project

In order to understand the evolutionarily conserved mechanisms of social emotion through innovative approaches, we organize the following three research groups.

A01: Whole-brain activation mapping and simultaneous measurement of activity in several regions of the emotional core neural circuit will reveal not just neural activity in response to unpleasant stimuli, but the dynamics of activity that only occurs when comparing the situation with others.

A02: We devise a new task using multiple individuals to induce envy in non-human primates and measure large-scale multiregional activity, including the emotional core circuit, to elucidate the neural mechanisms of envy arises from the processing of self-other differences.

A03: A social-emotional model incorporating functional modules based on neuroscientific findings will be constructed and functional hypotheses based on simulations will be proposed.

Through these groups, we will intercompare "simulation results" and "real responses" to identify the functional modules that are key to envy.

Expected Research Achievements

It is difficult to understand the underlying mechanism of social emotion only with a conventional static circuit map. In our research group, by integrating inductive and constructive approaches to understanding the mechanism, we hope to build a new interdisciplinary research field that integrates not only traditional neuroscience, but also psychology, sociology, psychiatry, and robotics.

Mental health issues in the field of medicine are of great importance. In recent years, the number of patients with psychiatric disorders, including depression and autism spectrum disorders (ASD), has continued to increase. Many drugs for the treatment of psychiatric disorders are the result of serendipity, and even today, there are few treatments for ASD. Patients with ASD are thought to have poor self-awareness in social relationships, and their inability to compare themselves to others does not function properly, leading to communication difficulties. Therefore, if the mechanism of envy based on the comparison of self and others that will be elucidated in our group can be applied to emotional robots and various simulations can be performed, an environment for developing new treatments that link the pathology of psychiatric disorders and their control.

In Japan's super-aging society, robots are playing an increasingly important role in the fields of medical care, nursing care, assisting the elderly and disabled, and mental health such as loneliness. Natural communication between humans and robots is indispensable to realizing an inclusive society in which humans and robots coexist in harmony. However, the current available robots are only pseudo-emotional expression robots that recognize specific situations and have not yet achieved natural communication. Understanding the social emotions of humans and animals through this field and incorporating them into robots will lead to the development of human-robot symbiosis.
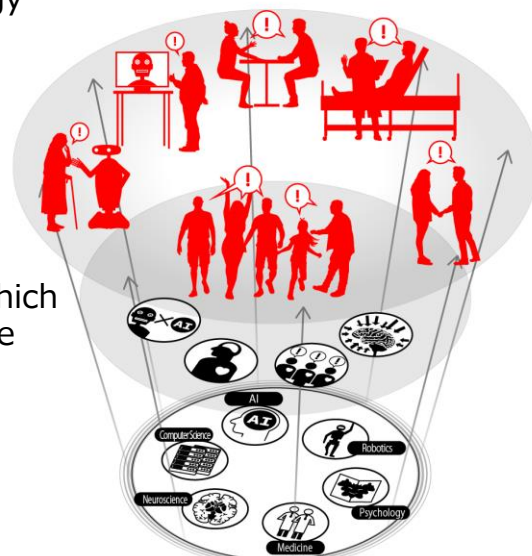

Figure 2. Expected achievements

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