15th Multicellular Autonomy seminar

Biological Quantifications in Development, Neural Behaviors, and Medicine

July 14th (Mon), 2025 | 16:00 – 17:30

Place: Memorial Auditorium and Museum of Medicine, Fac. of Med., Kyoto Univ.

会場: 基礎医学記念講堂・医学部資料館 (MAP)

Dr. Tian Xu

Chair Professor, Westlake University

Laboratory of Growth Regulation and Translational Research
School of Life Sciences, Westlake University
Hangzhou, Zhejiang Province, China
URL: https://en.westlake.edu.cn/faculty/tian-xu.html

Quantification is essential for both development and neural behavior. Our past efforts of genetic dissection in *Drosophila* identified key mechanisms for regulation of tissue size and growth in development and diseases, including the conserved Lats/Hippo and AKT/TSC/TOR pathways. However, the neural mechanisms for quantity discrimination of external matters remain elusive. Here, we report the establishment of a mouse model for quantifying different amounts of food, which is similar to human behavior, following the Weber-Fechner Law. Both viral inhibition experiments in mice and surgery data in patients have identified the specific cortex region involved in quantity discrimination behavior. Two-photon imaging of neuronal activities revealed that quantity discrimination is not coded by selected neurons with preferential activities or the number neurons. Instead, the synchronous firing patterns of the neuronal population correlate quantity discrimination behaviors. Following Shannon's Entropy for information and computer science, we propose a Neural Entropy model, which could predict quantity discrimination. Our study has not only provided a new biological quantification system key to human and animal survival, but also has significant implications for AI. Finally, we have developed AI models to quantify transcriptomic data in diseases, drugs, and herbal medicine and predicted potential therapies in clinical trials.

Contact 井垣 達吏，京都大学 (igaki.tatsushi.4s@kyoto-u.ac.jp)

文部科学省科学研究費助成事業 令和３年度～７年度 学術変革領域研究（A）
「競合的コミュニケーションから迫る多細胞生命システムの自律性」
URL: http://www.multicellular-autonomy.lif.kyoto-u.ac.jp/
E-mail: multicellular.autonomy@gmail.com