# 嗅覚・味覚シンポジウムのご案内

東京大学小柴ホールにて、嗅覚・味覚に関する学術セミナーを開催します。本セミナーでは、嗅覚、味覚研究の最先端で活躍する３人の研究者が、感覚認識とその神経基盤に関する最新の研究成果を発表します。
皆様のご参加を心よりお待ちしております。

日時：2023 年 9 月 14 日（木）15:30-17:30
場所：理学部 1 号館中央棟小柴ホール

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## From olfactory receptors to neuronal transcriptomic identities

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Abstract:
In vertebrates, chemoperception relies on a diverse set of neuronal sensors able to detect chemicals present in the environment, and to adapt to various levels of stimulation. The contribution of endogenous and external factors to these neuronal identities remains to be determined. Taking advantage of the parallel coding lines present in the olfactory system, we explored the potential variations of neuronal identities before and after

olfactory experience. We found that at rest, the transcriptomic profiles of mouse olfactory sensory neuron populations are already divergent, specific to the olfactory receptor they express, and are associated with the sequence of these latter. These divergent profiles further evolve in response to the environment, as odorant exposure leads to reprogramming via the modulation of transcription. Surprisingly, adenylyl cyclase 3, but not other main elements of the olfactory transduction cascade, plays a critical role in this activity-induced transcriptional adaptation. These findings highlight a broad range of sensory neuron identities that are present at rest and that adapt to the experience of the individual, thus adding to the complexity and flexibility of sensory coding.

References:

Horgue, L.F., Assens, A., Fodoulian, L., Marconi, L., Tuberosa, J., Haider, A., Boillat, M., Carleton, A., and Rodriguez, I. (2022). Transcriptional adaptation of olfactory sensory neurons to GPCR identity and activity. Nat. Commun. 13, 2929.

von der Weid, B., Rossier, D., Lindup, M., Tuberosa, J., Widmer, A., Col, J.D., Kan, C., Carleton, A., and Rodriguez, I. (2015). Large-scale transcriptional profiling of chemosensory neurons identifies receptor-ligand pairs in vivo. Nat. Neurosci. 18, 1455–1463.

## The neural basis of sugar and fat preference

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Abstract:

Sugar and fats evoke strong appetitive behavioural responses. Remarkably, animals still develop strong preferences for sugar and fat even if they lack a functional taste system. We demonstrated that intestinal sugar and fat convey preference signals via the vagus

nerve to the brainstem. Indeed, experimental activation of this gut-brain circuit drives behavioural preference. Through functional imaging, we uncovered 2 parallel vagal pathways: one, dedicated to the detection of fat, while the other, surprisingly, is a generalist nutrient pathway that responds to sugar, fat and amino acids. While each nutrient is detected in the gut via distinct transduction mechanisms, the convergence of different nutrient signals into the generalist vagal pathway highlights the elegant logic of this circuit: after the gut cells are activated, the gut-brain axis does not need to preserve the identity of the specific nutrient stimulus, and only has to ensure that the emerging gut-brain message triggers behavioural preference.

References:

Tan, H.-E., Sisti, A.C., Jin, H., Vignovich, M., Villavicencio, M., Tsang, K.S., Goffer, Y., and Zuker, C.S. (2020). The gut–brain axis mediates sugar preference. Nature 580, 511–516.

Li, M., Tan, H.-E., Lu, Z., Tsang, K.S., Chung, A.J., and Zuker, C.S. (2022). Gut–brain circuits for fat preference. Nature 610, 722–730.

# Transcriptomic identification of a central module for sodium consumption

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Abstract:

Recent studies have identified neural circuits that drive the intake of a specific nutrient. Such dedicated circuits integrate interoceptive signals and induce programmed behaviors such as seeking and consumption. While we previously focused on the modulations of a dedicated neural circuit, we further investigated how to dissect circuits into distinct

modules. Using the sodium appetite neural circuit as an access point, we traced the neural signals downstream. As one of the direct downstream, we have found that neural signals must transmit into the lateral hypothalamus for sodium appetite. Because of the heterogenous in the LH, it was unclear which signals were carried on the LH. To address this question, we employed state-to-cell type transcriptomics to identify the cell type where the signals are received. Optical imaging and neural manipulation demonstrated that this genetically defined LH neural population selectively controls consummatory motor action. Notably, acute neural stimulation instantly induced consumption but did not trigger nutrient-seeking/appetitive action. Furthermore, we identified this unique activation pattern is shared across different macronutrients. Thus, a common LH neural pathway is recruited in a behavioral-phase-specific and nutrient-promiscuous fashion. These results provide an experimental framework to delineate complex LH neuronal functions and reveal how divergent interoceptive signals are converged onto a downstream circuit to drive consummatory behavior.

References:

Lee, S., Augustine, V., Zhao, Y., Ebisu, H., Ho, B., Kong, D., and Oka, Y. (2019). Chemosensory modulation of neural circuits for sodium appetite. Nature 568, 93–97.

Augustine, V., Lee, S., and Oka, Y. (2020). Neural Control and Modulation of Thirst, Sodium Appetite, and Hunger. Cell 180, 25–32.

# アクセス

最寄駅

地下鉄利用

本郷三丁目駅（地下鉄丸の内線／地下鉄大江戸線）徒歩 10 分

根津駅（地下鉄千代田線）徒歩 10 分

東大前駅（地下鉄南北線）徒歩 6 分

バス利用

御茶ノ水駅（JR 中央線、総武線）

— 学 07 東大構内行 — 東大（構内バス停）下車

上野駅および御徒町駅

— 学 01 東大構内行 — 東大（構内バス停）下車

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