

論文の内容の要旨

論文題目 SINGLE-CELL-RESOLUTION MOUSE BRAIN ATLAS FOR WHOLE-BRAIN ANALYSIS OF CELLS

(一細胞解像度マウス脳アトラスによる全脳全細胞解析)

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To understand the cellular components and circuits underlying complex physiological behaviors, a technique has been demanded which enables in situ identification and quantification of cellular properties at whole-organ scale. To that end, I revealed the chemical principle underlying tissue clearing by performing the comprehensive chemical screening. Based on the principles, several scalable tissue-clearing protocols were designed which allow whole-organ cell profiling, whole-body imaging including bone tissues, and human tissue imaging. Combining tissue clearing and tissue expansion, I finally identified all cells existing in a mouse brain, hence constructed three-dimensional single-cell-resolution mouse brain atlas (CUBIC-Atlas). With this point-based atlas, I holistically analyzed pharmacologically induced cellular activities in a mouse brain as the first demonstration of whole-organ analysis of cells. Such a bottom-up approach to understand an organ will elucidate the undiscovered relation between cell state and physiology.