

## 人工知能を活用し寄生菌による行動支配様式を解明

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寄生生物の中には宿主を支配し、操っているかのように行動を変化させてしまうものが存在する。しかし、これらの寄生生物がどのように“マインドコントロール”を行っているか詳細は明らかになっていない。著者らは serial block-face scanning-electron microscopy (SEM) と深層学習を用いた画像解析により、菌類に乗っ取られ不可解な行動をとるようになった「ゾンビアリ」の標本を 3D モデル化した。その結果、驚くべきことにこの寄生菌は宿主の脳には侵入せず、脳の外側から宿主の行動を支配していることが明らかになった。

## 紹介論文

**Three-dimensional visualization and a deep-learning model reveal complex fungal parasite networks in behaviorally manipulated ants**

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## 要旨

Some microbes possess the ability to adaptively manipulate host behavior. To better understand how such microbial parasites control animal behavior, we examine the cell-level interactions between the species-specific fungal parasite *Ophiocordyceps unilateralis sensu lato* and its carpenter ant host (*Camponotus castaneus*) at a crucial moment in the parasite's lifecycle: when the manipulated host fixes itself permanently to a substrate by its mandibles. The fungus is known to secrete tissue-specific metabolites and cause changes in host gene expression as well as atrophy in the mandible muscles of its ant host, but it is unknown how the fungus coordinates these effects to manipulate its host's behavior. In this study, we combine techniques in serial block-face scanning-electron microscopy and deep-learning-based image segmentation algorithms to visualize the distribution, abundance, and interactions of this fungus inside the body of its manipulated host. Fungal cells were found throughout the host body but not in the brain, implying that behavioral control of the animal body by this microbe occurs peripherally. Additionally, fungal cells invaded host muscle fibers and joined together to form networks that encircled the muscles. These networks may represent a collective foraging behavior of this parasite, which may in turn facilitate host manipulation.