English-writing course assignment: Examples of abstract

Example 1

S.-J. Park, et al. (2016). "Phototactic guidance of a tissue-engineered soft-robotic ray." Science 353: 158-162.

Inspired by the relatively simple morphological blueprint provided by batoid fish such as stingrays and skates, we created a biohybrid system that enables an artificial animal—a tissue-engineered ray—to swim and phototactically follow a light cue. By patterning dissociated rat cardiomyocytes on an elastomeric body enclosing a microfabricated gold skeleton, we replicated fish morphology at 1/10 scale and captured basic fin deflection patterns of batoid fish. Optogenetics allows for phototactic guidance, steering, and turning maneuvers. Optical stimulation induced sequential muscle activation via serpentine-patterned muscle circuits, leading to coordinated undulatory swimming. The speed and direction of the ray was controlled by modulating light frequency and by independently eliciting right and left fins, allowing the biohybrid machine to maneuver through an obstacle course.

Example 2

J. H. McDermott, et al. (2016). "Indifference to dissonance in native Amazonians reveals cultural variation in music perception." Nature 535, pp. 547-550.

Music is present in every culture, but the degree to which it is shaped by biology remains debated. One widely discussed phenomenon is that some combinations of notes are perceived by Westerners as pleasant, or consonant, whereas others are perceived as unpleasant, or dissonant. The contrast between consonance and dissonance is central to Western music, and its origins have fascinated scholars since the ancient Greeks. Aesthetic responses to consonance are commonly assumed by scientists to have biological roots, and thus to be universally present in humans. Ethnomusicologists and composers, in contrast, have argued that consonance is a creation of Western musical culture. The issue has remained unresolved, partly because little is known about the extent of cross-cultural variation in consonance preferences. Here we report experiments with the Tsimane'—a native Amazonian society with minimal exposure to Western culture—and comparison populations in Bolivia and the United States that varied in exposure to Western music. Participants rated the pleasantness of sounds. Despite exhibiting Western-like discrimination abilities and Western-like aesthetic responses to familiar sounds and acoustic roughness, the Tsimane' rated consonant and dissonant chords and vocal harmonies as equally pleasant. By contrast, Bolivian city- and town-dwellers

exhibited significant preferences for consonance, albeit to a lesser degree than US residents. The results indicate that consonance preferences can be absent in cultures sufficiently isolated from Western music, and are thus unlikely to reflect innate biases or exposure to harmonic natural sounds. The observed variation in preferences is presumably determined by exposure to musical harmony, suggesting that culture has a dominant role in shaping aesthetic responses to music.

Example 3

Y. Yada, R. Kanzaki and H. Takahashi (2016). "State-dependent propagation of neuronal sub-population in spontaneous synchronized bursts." Front Syst Neurosci 10: Art 28.

Repeating stable spatiotemporal patterns emerge in synchronized spontaneous activity in neuronal networks. The repertoire of such patterns can serve as memory, or a reservoir of information, in a neuronal network; moreover, the variety of patterns may represent the network memory capacity. However, a neuronal substrate for producing a repertoire of patterns in synchronization remains elusive. We herein hypothesize that state-dependent propagation of a neuronal sub-population is the key mechanism. By combining high-resolution measurement with a 4,096-channel complementary metal-oxide semiconductor microelectrode array and dimensionality reduction with non-negative matrix factorization, we investigated synchronized bursts of dissociated rat cortical neurons at approximately three weeks in vitro. We found that bursts had a repertoire of repeating spatiotemporal patterns, and different patterns shared a partially similar sequence of sub-population, supporting the idea of sequential structure of neuronal sub-populations during synchronized activity. We additionally found that similar spatiotemporal patterns tended to appear successively and periodically, suggesting a state-dependent fluctuation of propagation, which has been overlooked in existing literature. Thus, such a state-dependent property within the sequential sub-population structure is a plausible neural substrate for performing a repertoire of stable patterns during synchronized activity.