Joint Encoding of Motion and Music in a Neuron in the Sea Monkey *Artemia Salina* - An Evolutionary Antecedent of *Trouba Du*?

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Introduction

When we see an unfamiliar person in a parking lot, sporting a guitar and dressed in quaint clothing, we instantly are overcome with an intense feeling of *trouba du*, the instinctive recognition of a traveling poet.

Figure 1

Little research has been done on the neuronal basis of this striking phenomenon, but it would be highly probable that some neurons strongly correlate with its occurrence. Neurophysiological experiments in the past have shed some light on the details of neuronal behavior, but traditional laboratory animals for such experiments are quite expensive in acquisition, rather smelly, and difficult to maintain. Some of them even bite.

In contrast, the animals chosen for this study are comparatively cheap, easy to obtain, and can be kept in a little jar on an averagely cluttered desktop. Their humanlike appearance and behavior are evidenced by numerous illustrations (e.g. Figure 1), making them ideal experimental models for human behavior. Contrary to the impression created by Figure 1, they are not really people, though, so putting them in experiments is fine.

Methods

The use of *Artemia Salina* and the experimental protocol were not approved by UC Berkeley's Animal Care and Use Committee, since, outrageous as it may sound, sea monkeys do not qualify as animals according to the definition of the committee. Great care was taken to ensure the animals' welfare. They were kept in an enclosure resembling their natural habitat, the Amazing Live Sea Monkeys® Magic Castle, and only taken out for experiments. Animals were fed a balanced diet of Sea Monkeys Growth Food® and regularly taken on walks in the Amazing Live Sea Monkeys® Aqua Watch.

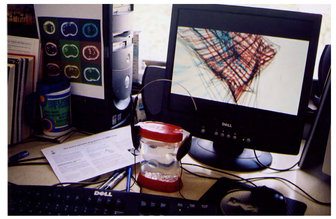
Figure 2

For experimental sessions, a healthy, full grown animal was selected from the population and extracted from the Magic Castle using the Amazing Live Sea Monkeys® Aqua-Leash™. The animal was then placed with its head on a very, very thin wire mounted on the wall of the experimental aquarium. Once the animal was in place on the wire, its position was fixed using super glue. The aquarium was then filled with saline solution, a second thin wire was placed in the solution, both wires were connected to a fancy digital multimeter, a pair of headphones positioned on the outside of the aquarium close to the animal and the complete setup placed in front of a computer screen (see Figure 2). Stimuli consisted of colourful moving visual patterns and an auditory presentation of contemporary popular music and were displayed using Winamp 5.

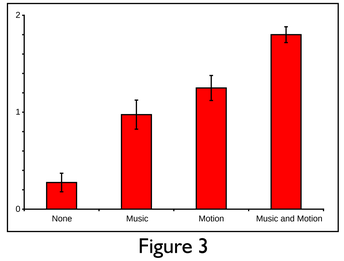

Figure 3

Results

Four readings of the multimeter were taken for each of four conditions (no stimulus, music, motion, music and motion, see Figure 3). The multimeter readings of the recorded neuron shows activity for both stimulus modalities and interaction between the two, indicating joint encoding of those modalities in this neuron. I postulate that the recorded neuron is part of a much larger and possibly very complicated network that is involved in multisensory integration. I shall present an impressive model consistent with these experimental findings in due time.

I confirmed in post mortem histology of the sea monkey's head that the recorded neuron was indeed located inside of it. Various staining dyes were applied and looked very pretty (Figure 4).

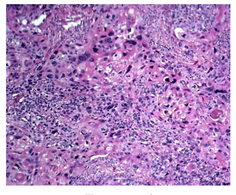
Figure 4

Combination with FMRI

I also repeated these experiments using a very special and complicated device for combining Functional Mechanic Resonance Imaging (FMRI; Schreiber, SFN 2002) and neurophysiological measurements in the Sea Monkey (see cartoon in Figure 5). For this purpose, a nanohammer mounted on a resetable spring was added to the experimental setup. During display of the visual and auditory stimuli, resonance pulses were delivered to the animal's head. The reaction was measured as the magnitude of limb movement resulting from the nanohammer stimulation. The location of the hammer relative to the animal's head could be adjusted by sliding the very, very thin wire up and down the aquarium wall. I want to stress that measurements using this device were extremely difficult and required great experimental skills. Analysis of the FMRI data revealed that the focus of FMRI activity was also inside the animal's head. These results clearly demonstrate the feasibility of functional mechanic resonance imaging in the Sea Monkey and validate FMRI as a technique.

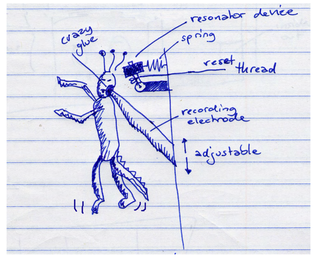

Figure 5

Discussion

It is currently unknown whether Sea Monkeys experience an equivalent to the *trouba du* sensation of humans. This is an interesting field for further research. The present results, however, clearly indicate the possibility that *trouba du* might be evolutionarily older than could have been previously suggested and show a neuron in the sea monkey *Artemia Salina* to jointly encode motion and music, providing a neural substrate for this common and well known percept. Furthermore, the results demonstrate the validity of the use of sea monkey brains as a model for the human mind. This has the potential of vastly simplifying most neurophysiological research programs and of freeing up large funds for budget cutting. Finally, an impressive experimental setup has been developed for simultaneous recordings of neural activity and FMRI in the sea monkey. All things considered, the present study must be considered extremely well founded and highly valuable to human society as a whole.