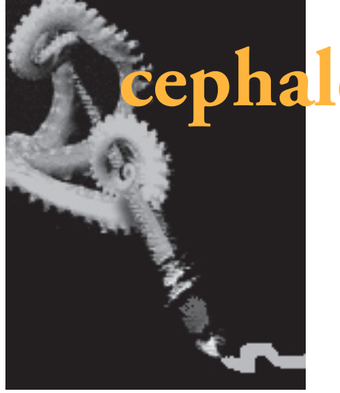

PETER SYMES

Think fast - like a squid!

Text by Naiha Balal Khiljee

Squids, octopus and cuttlefish (who all belong to the phylum of molluscs) are among the most intelligent animals in the sea, and definitely the most intelligent marine invertebrates. We should in fact ask ourselves if the human mind is capable of thinking as fast as these creatures do.

We applaud our nervous system, but interestingly, squids have unusually large neurons, which makes them a lot faster than us. These gigantic neurons are much easier to study than the normal minute neurons found in animals and humans. This has assisted scientists in gaining further basic knowledge and understanding about the functioning of the rather complex nervous systems in animals as well as humans.

Neurons consist of a somatic cell body containing the nucleus with DNA, and several cell organelles in the cytoplasma surrounding the nucleus (see Figure 1). The somatic part has many dendritic ends who receive signals from many other neurons. A long axon runs from the somatic part of the neuron, where the electric nerve signal travels with an astonishing speed of about 360km per hour. This electrical signal finalizes its axonal journey into many synaptic ends, where it manages to trigger synaptic secretions of chemicals (neurotransmitters: e.g. certain hormones like oxytonin) which travel into the intercellular space and reaches specific receptors attached to the surface of adjacent neurons.

In squids, axons carry information to the muscles of a squid's mantle when it is startled, causing them to contract and jet to safety. It is the axonal part of the neuron in squids which is rather large (considering that typical axons in humans are only a few micrometers in diameter)—up to 1mm in diameter. The squid giant axon is several hundred times larger than the typical human axon. Such neurons are obviously much easier to see in microscopes than the typical smaller neurons. This helps researchers to comprehend how the mind functions.

The mind

The mind is an intriguing part of the body. It is like an abstract work of art, which we have not come to fully comprehend yet. The nervous system is complex and consists of two departments: The CNS—which is the central nervous system—and the PNS, which is the peripheral nervous system. The CNS consists of the brain and spinal cord, while the PNS consists of two kinds of nervous cells: sensory nervous cells and motor nervous cells. The motor nervous cells carry electrical impulses sent from the CNS to organs, muscles and glands.

The motor nervous system is divided into the autonomic nervous system and the somatic nervous system. The autonomic nervous system controls involuntary muscles (smooth and cardiac muscles), which explains why our heart beats even though we are not conscious about it. The autonomic nervous system can be divided into two additional nervous systems, which illustrates the complexity of the nervous system.

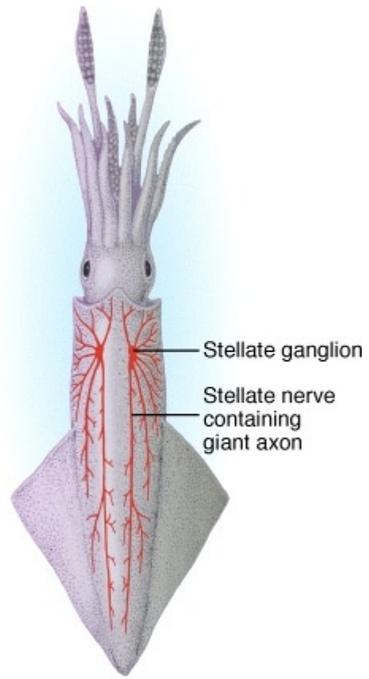

Figure 1

The somatic nervous system controls skeletal muscles as well as external sensory organs such as the skin—this nervous system is unlike the autonomic nervous system "conscious" while we control it consciously (with the small exception of reflex reactions).

Cells of the sensory nervous system send information to the CNS from internal organs or from external stimuli. So basically, the CNS, which consists of loads of neurons, is the "masterkey" of the entire nervous system.

When looking closely at these neurons, it is inevitable that the most essential part of a neuron is the axons, because the axons carry the electrical impulses, which allow one part of the nervous system to communicate with another.

We have doctors and specialists examining these axons, and we are all very fascinated by our nervous system, but rarely is it acknowledged that squids actually have much bigger axons, which means that information runs far more rapidly through their nervous system, making their reactions much faster than those of human beings. So, the next time you are diving in the wondrous ocean—know that you will not be able to reach a squid! ■

Squid Behaving Badly

Text by Catherine GS Lim

CHUN & VALDIVIA. DIE CEPHALOPODEN, 1910 / WIKIPEDIA PUBLIC DOMAIN

When it comes to mating, it seems that the deep-sea squid isn't too picky. New research has shown that the 12-centimetre cephalopod would mate with any deep-sea squid it came into contact with, be it female—or male.

However, despite the potentially sensational nature of this observation, this behaviour may just be a case of mistaken identity in the blinding depths of the deep ocean.

Prior to this discovery, it was believed that male deep-sea squid mated by depositing their spermatophores (packages containing millions of sperm) onto the female's body. The sperm are then absorbed into her tissues. Evidence of the interaction would be in the form of the sperm sac left on the female's body.

A straightforward concept, except that when researchers reviewed video footage taken over 20 years in the Monterey Submarine Canyon, off the Californian coast, USA, sperm sacs were found on both female and male squid.

Writing about it in the Royal Society journal, *Biology Letters*, lead author Henk-Jan Hoving, from the Monterey Bay Aquarium Research Institute, explained that as "the locations of sperm packages were similar in both sexes, we concluded that males mate with males and females".

It seems that this behaviour is rooted in practicality. Living at dark depths of 400 to 800 metres, the solitary deep-sea squid often find it hard to bump into one of its own species.

And even when it does bump into someone, determining its gender may prove difficult in the dark.

So, instead of letting an opportunity slip away, it would simply initiate the mating process, and hope that its partner was indeed a prospective female.

Explaining this behaviour as a reproductive strategy, Hoving said, "Squid, including deep-sea species, only reproduce once and they have to find mates in time in an environment where encounters between individuals of the same species are few and far between." ■