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Clever Cephalopods

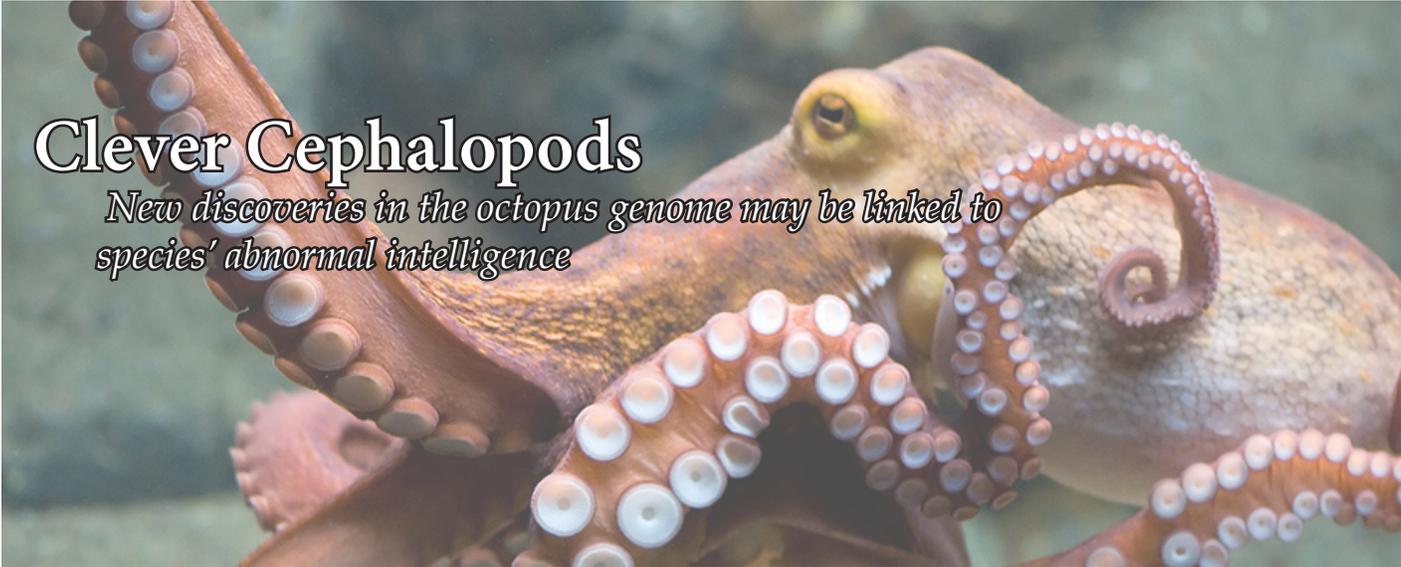
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Clever Cephalopods

New discoveries in the octopus genome may be linked to species' abnormal intelligence



by Maggie Masterson

With thousands of little suction cups, eight legs, and one unusually large brain, the octopus is unlike any other animal. These ocean-dwellers are versatile, flexible, and intelligent, leaving scientists to ponder what evolutionary machinations created such a unique organism. Octopuses have demonstrated their abilities to complete mazes, solve problems, and even utilize tools—feats which other members of their phylum are not capable of accomplishing. Sequencing of the octopus genome is giving scientists insight about why our eight-legged friends are smarter than the average mollusk.

Understanding the octopus genome has helped scientists elucidate the origin of the cephalopod's abnormal intellect, as described in *Nature*. Researchers at the University of Chicago were shocked to learn that the octopus genome is nearly as large as the human genome. It also encompasses a greater number of exons, or protein-coding regions, than the human genome does. Additionally, many of these exons encode proteins for the development of neurons and their interactions. Octopuses have a very advanced nervous system, so it seems logical that many of their genes should dictate the structure of neurons and related fibers. With half a billion neurons, octopuses are six times more advanced than mice in terms of neural pathways, allowing them to easily manipulate their surroundings. Several genes coding for proteins known as reflectins were also identified. Reflectins allow light to bounce off an octopus's skin, allowing it to camouflage and disguise itself.

“Scientists are postulating that these protein systems are the reason octopuses can readily adapt their neural-network.”

But the most interesting genomic discovery was a system of rapidly modifying proteins. These proteins have the ability to change their function, and the purpose of their surrounding tissue, very quickly. Scientists are postulating that these protein systems are the reason octopuses can readily adapt their neural-network, facilitating their extraordinary learning abilities and memory functions. This would be best confirmed by genomic sequencing of other mollusks, and comparing the results.

While the octopus genome revealed a few surprises, there are likely many more secrets within the genome that we haven't yet uncovered. There is a great deal that we don't yet understand about genomics, and the genetic basis of intelligence. Nevertheless, this research is a huge step in the right direction. The octopus is an uncommonly complex invertebrate, and learning more about the molecular basis of its unusual abilities will help scientists understand more about other species as well. 🐾