The Extraordinary within The Ordinary: Perceptions of Beauty

(Mucus is magical if you are a mollusk!)

By Shelley Hanson

As we know, beauty is subjective. I would like to alter your perception of beauty by looking at the world through the eyes of a mollusk. When I mention the word snail, what do you envision? Most people associate snails with a "slimy" quality. Snails are mollusks, a Latin word meaning soft-bodied. As their tender bodies glide along the rough terrain, land snails secrete mucus to lubricate their path.

The mucus is so effective at protecting mollusks that they have been observed crawling over upended knife blades unharmed.

Land snail encountering knife blade…up and over by secreting mucus.

Because of mucus, the snail continues on its path uninterrupted. It doesn't perceive the blade as an obstacle, much less a source of danger. And, for the snail, it proves to be neither.

Let's leave the land snails and look at other specialists employing mucus in magical ways: The purple-hued Janthina shell, also known as the Purple Sailor, lives far from shore on the ocean's surface. This may not seem like much of an accomplishment until you stop to consider that this animal can't swim. How is it able to live on the surface of the ocean? It uses mucus to cement air bubbles together and constructs a raft. The janthina attaches underneath and spends its entire life floating on its raft, hence the moniker "Purple Sailor."

If it becomes dislodged from the raft, it drowns. Its survival depends upon clinging to the bubbles.

The harp snail has developed its own wonderful employment of mucus. Its protruding foot is many times the size of its shell, enticing predators..

Close-up view of the mollusk's eyes and siphon (breathing tube)

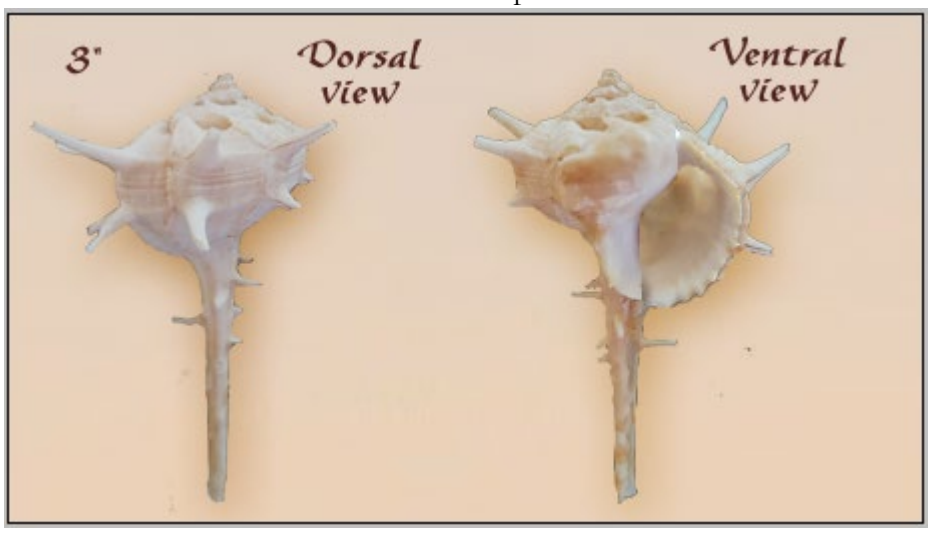
The harp has the ability to detach a portion of its massive foot. This is a small sacrifice as the foot will regenerate. It uses this ability when pursued by a predator, such as a crab. Since the crab is seeking to dine on the harp, by shedding a portion of its foot to preoccupy the crab, the harp could get away. Instead, while the crab is fixated on enjoying its morsel, the harp secretes mucus, mixing it with sand, and coats the crab. The unsuspecting crab becomes immobilized, and then the harp eats the crab. Willing to make a small sacrifice, the harp receives a big reward. It completely turns the tables, enabling the intended victim to be the victor. What remarkable strategy!

How mollusks contributed to the symbol of royal heritage

The word "purple" derives from man's interaction with shells and mollusks. The ancient Greeks called the territory near present-day Syria "Phoenicia," which means "land of the purple" in deference to the purple cloth they exported. During this period, there were not many methods for dying cloth. Someone discovered that the purpura murex secreted a clear fluid that when left out in the sun transitioned through various colors eventually arriving at what we now call purple. This fluid was capable of not only staining material, but more importantly, remaining permanently fixed in the cloth. The Phoenicians capitalized upon this discovery and introduced an entire industry of purple cloth production.

Since each murex yielded only a few drops of punicin, the purple-producing chemical, it took thousands of murex to produce enough dye for one pound of cloth. This made the cloth prohibitively expensive. In fact, only royalty could afford it. To hasten the process, rather than waiting for the sun to perform the transformation, the mollusks were boiled. Amassing huge quantities of this material in enormous vats, caused a foul smell that was a cross between bromine gas and garlic. The dye vats had to be located down-wind from towns, and anyone wearing this cloth had to afford perfume to mask the odor. Here again, perfume was a luxury only royalty could afford. The color purple became symbolic of royalty, leading to the expression "born to the purple" to indicate someone of royal lineage.

The shell of the Purpura Murex:



As we leave ancient Phoenicia and progress in time, we find other mollusks that contain similar dye-yielding chemicals. In the 16th century, natives in Central America used a similar method of dye production with the Wide-Mouthed Purpura. As they exported this dye to Spain, demand increased, and their supply of mollusks dwindled. Necessity dictated finding alternative approaches to dye production.

Today, in Latin America, the wide-mouthed purpura mollusks meet a kinder fate than those sacrificed in Phoenicia. Man has learned to milk their dye-producing glands by gently blowing inside their shell or carefully squeezing the foot of the snail. This procedure permits the fluid to be obtained from the live mollusk, and allows the animal to continue producing future dye material. Both man and animal benefit as this technique manages to increase dye production while sparing the lives of the mollusks. With the foresight involved in this humane treatment by man, humans have learned to look at the big picture, working for the benefit of all.

The shell of the Wide-Mouthed Purpura

Powerful medications from the poison cocktails of mollusks

Cone mollusks are unique in the anatomical apparatus they possess for feeding. They are carnivores, but unlike other carnivore mollusks, cones use poison to paralyze their prey. A gland in their head serves as the reservoir for the poison. Their teeth are shaped like tiny harpoons connected to this gland through a tube. The poison is similar to snake venom, and upon injection the prey experiences an inability to mount any coordinated response. This is rapidly followed by a systematic shut down of each internal organ. Through this mechanism, a snail can eat a fish.

All cones contain this harpoon delivery system, but not all poisons are equally toxic. Some cones only eat tubeworms, and they are far less dangerous to humans than those that eat fish. A few cones, such as the textile and geography cones carry a more potent and dangerous dosage. These poisons are cocktails of proteins making it impossible to create an antivenom. There are several cases of fatalities to man. In fact, the geography cone was called the cigarette snail because if you were injected with their venom, you would just have time to smoke a cigarette before you die.

Although geography cones are among the deadliest, scientists discovered that by altering their paralyzing venom just a little, it serves medicinally for those patients suffering from tremors. Apparently, the paralyzing action of the venom counteracts the shaking.

And geography cones are not the only cone species involved. Over the years, reports have increased on how cone venoms, termed conotoxins, are used medicinally. In January 2004, following clinical trials, scientists announced that a protein found in the poison cocktail from the magus cone is a very effective painkiller that gives relief to cancer and AIDS patients who can no longer take morphine. Delivered through an implanted intrathecal pump into a patient's spinal fluid, this drug is 1,000 times more powerful than morphine and not addictive.

In 2005, Newsweek reported that a drug mimicking another conotoxin provided relief for patients suffering from chronic back pain. With additional applications in neurology and oncology, scientists are developing drugs for epilepsy, Parkinson's, Alzheimers, addiction, and potentially diabetes. The research continues as scientists await the next medical conotoxin breakthrough..

If you see these snails in the ocean, please admire from afar! Their harpoon teeth can penetrate through a wet suit.

The amazing innovations inspired from mussels

A discussion of medical applications would not be complete without mention of the contribution from mussels. These mollusks secrete a liquid material that quickly hardens into stringy filamentous threads called byssus. These threads serve as anchors to wharves and rocks preventing the mussels from becoming dislodged and damaged by the tides. When a mussel does relocate, the journey begins by loosening a few threads and repositioning them. Once these are secure, they loosen a few more old ones to add to the new site. This process continues until the animal is fully relocated. By this means, they are capable of climbing up wooden piers, or to more desirable rocky locales. With these stable foundations, they are able to survive the pounding waves.

It turns out that the mussel byssus is considered to be marine super glue. Scientists are studying mussels because water has destroyed the bonds of every adhesive devised by man. Finding a glue that will not erode in water has been a long-standing technical challenge.

J. Herbert Waite, who has studied mussels for over 20 years says, "Byssus binds more powerfully, more rapidly and more persistently to more hard surfaces than any synthetic adhesive for underwater applications. No synthetic glue designed for watery settings comes close to rivaling nature's own… This animal is at the cutting edge of marine adhesive technology."

The exciting thing is that if scientists can mimic the byssus glue, they could use this in other watery environments such as the human body. It could provide alternatives for surgical glue used in tissue grafts, sutureless operations and dental applications.

In a 2013 article titled "Mussels inspire innovative new adhesive for surgery", it states “Animal studies of sutureless wound healing using this recombinant mussel adhesive are encouraging, and plastic surgery and reuniting severed nerves rank high on the long list of potential applications.”

In 2017, building upon revelations from studying mussel glue, biomimicry efforts have produced an adhesive 17 times stronger than mussel glue for bonding underwater.

In an article from 2025, MIT engineers have created mussel inspired polymers “to produce a fast-acting, bacteria-blocking, waterproof adhesive for use in biomedical applications.”

As you explore the world around you, I hope these examples encourage you to look at the world through new eyes. If these mollusks could alter the way you perceive mucus, what might insects, or birds or other animals lead you to discover? What about flowers or trees? Consider the wind, or the ocean. Imagine looking at the world from these alternative perspectives, and see what beauty is right before your eyes.