



Hello students,

Here is Class 5, devoted to Cone shells. As you will see, there are many other links to visit. This is one area of research where the internet is constantly changing. Also, students have a variety of interests. I have tried to gather a wide range of options regarding these amazing animals, and as always, feel free to view what resonates and leave the rest. 😊

Many Seashell Blessings!

Shell

INDEPENDENT STUDY: Module1, Class 5

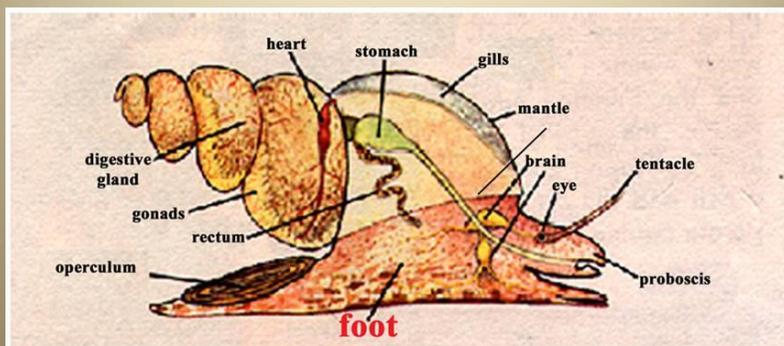
Please note: The pictures and comments in the transcript and recording below have been gathered over many years and where possible, I attribute them to their original source. If anyone connected with these photographs or comments would like them removed, please notify me and I will be happy to comply.

The recording for Class 5 is almost 38 minutes and is in your attachments.

CLASS 5: Shell #s 80,76,77

Before we begin this class, there is another technical piece of information I want to share with you. When we studied the 5 classes of mollusks, you learned them as Univalve, Bivalve, Tusk, Chiton and Cephalopod. Through your emails, I have noticed your enthusiasm for this information, and in case any of you do any research, I wanted you to know that these 5 classes are also referred to by the type of foot, or “pod” these animals possess. We already discussed that Cephalopod means “head-foot.”

Univalve



Gastropod

Univalves are called Gastropod which means stomach-foot because these snails look like they are crawling on their stomachs. This is not correct, that “stomach” is actually their foot. When you look at the Gastropod anatomy to the left, you will see the foot clearly marked in red at the bottom of the picture. The drawing permits you to have x-ray vision penetrating inside the shell. If you allow your eye to wander above the word “foot”, you will find the stomach is a separate organ tucked inside the animal’s shell. This proves they do not crawl on their bellies, so the name Gastropod is misleading. (By the way, this is where the Nudibranchs fit in, as a sub-class of the Gastropods.)

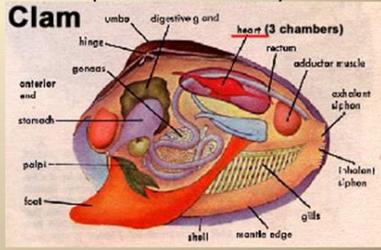
Univalve...Gastropod
(Stomach-foot)



Cephalopod
(Head-foot)



Bivalve...Pelecypod
(Hatchet-foot)

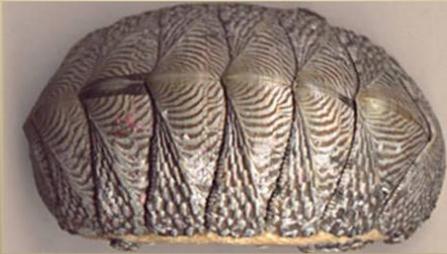


Tusk...Scaphopod
(Shovel-foot)



Bivalves are Pelecypods which means “hatchet-foot.” Tusks are called Scaphopods meaning “shovel-foot”.

Chiton...Polyplacophora
(Bearing many plates)

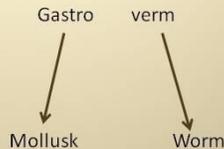


The Chitons are not referenced by this foot approach. Instead, they are called Polyplacophora meaning “bearing many plates”.

I wanted to address this to avoid any confusion you may have if you come across these terms.

Now, as you just learned, Chitons are Polyplacophora meaning bearing many plates.

Neopilina Gastroverm



This animal has a shell like mollusks, but it has a segmented body like worms. It not only has five pairs of gills, but has two or more pairs of several other organs as well. The heart has two ventricles and two pairs of auricles...Instead of one pair of kidneys, there are six pairs with each separate kidney opening to the outside by means of its own small pore in the mantle cavity. Neopilina has eight pairs of shell muscles even though it only has one shell.

Chiton...Polyplacophora (Bearing many plates)

Gastroverm...Monoplacophora (Bearing one plate)

I want to pause here to tell you about Gastroverms. This is another class of mollusks with just a few live specimens, believed to be the missing link between mollusks and worms. The Gastro section of their name indicates Mollusk, and the Verm connects with worms.

If you want to learn more about Gastroverms, you will find they too have another name. Chitons are Polyplacophora, (bearing many plates) and these animals are called Monoplacophora, (bearing one plate.)

Let me explain the significance of this. Scientific classification begins with sorting everything into Kingdoms. Are you animal, vegetable or mineral? Within the animal Kingdom, we have a variety of Phyla. For instance, are you an animal who has a backbone, (vertebrate,) or who does not have a backbone, (invertebrate.)

Following this comes Class. Scientists knew the Gastoverm existed from Fossil records, but they were shocked when the Dutch ship Galathea discovered live specimens in 1952 off the coast of Costa Rica. These are animals with shells (like mollusks) that possess a segmented body (like worms.) They are sometimes considered a 6th class of mollusks along with Univalves, Bivalves, Tusks, Chitons and Cephalopods. Scientists always suspected this "missing link" from fossil evidence dating back 400,000,000 years, but were amazed to find live specimens in the 1950's.

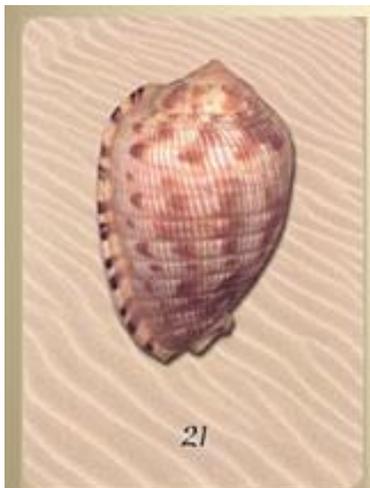
To quote from a library book I had in the 1970's, speaking about the Neopilina Gastroverm ...

"The foot is surrounded by ten movable gills, five on each side....It not only has five pairs of gills, but has two or more pairs of several other organs as well. The heart has two ventricles and two pairs of auricles...Instead of one pair of kidneys, there are six pairs with each separate kidney opening to the outside by means of its own small pore in the mantle cavity. Neopilina has eight pairs of shell muscles even though it only has one shell."

<http://www.ucmp.berkeley.edu/taxa/inverts/mollusca/monoplacophora.php> [More on Monoplacophora](#)

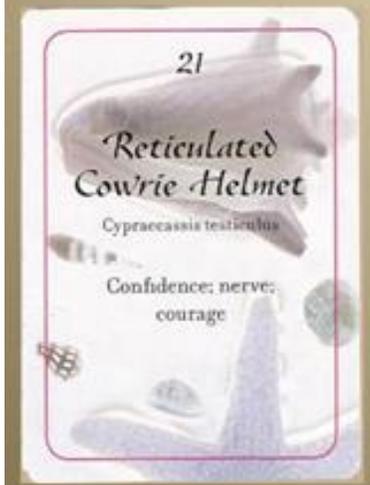
With so few of these shells in existence, for the purposes of this course, we will confine ourselves to the other 5 classes of mollusks.

OK. Let's get to our lesson for Class 5!

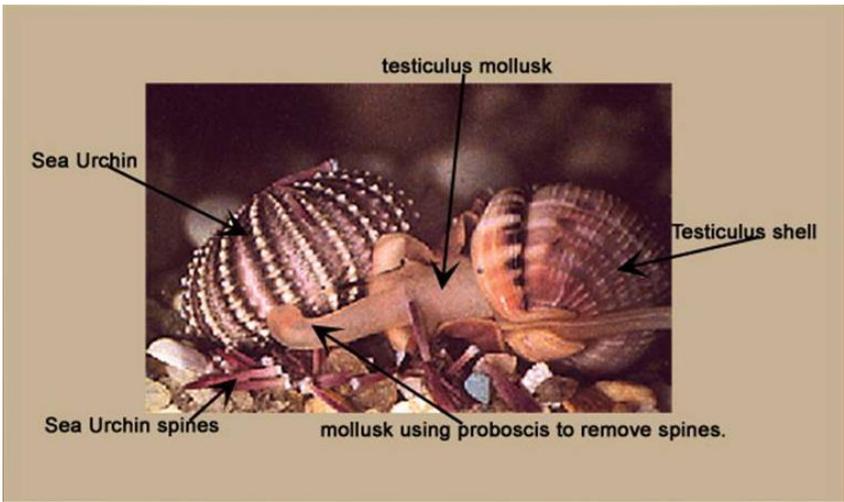


Since these classes build upon each other, we are going to revisit a few friends. In Class 4, you met the Reticulated Cowrie Helmet, also known as the *Cypraea testiculus*. Based upon its appearance and name, it conjured a connection to a certain part of male anatomy, and became associated with the concept of courage in seashell divination.

You also learned that Ocean Oracle is organized into meanings deriving from 4 categories. The meanings based upon Name and Appearance are bordered in blue and fall into shell numbers 107-168. Knowing this, based upon the name *testiculus*, you would expect this shell to have one of those numbers between 107-168 and to be bordered in blue.



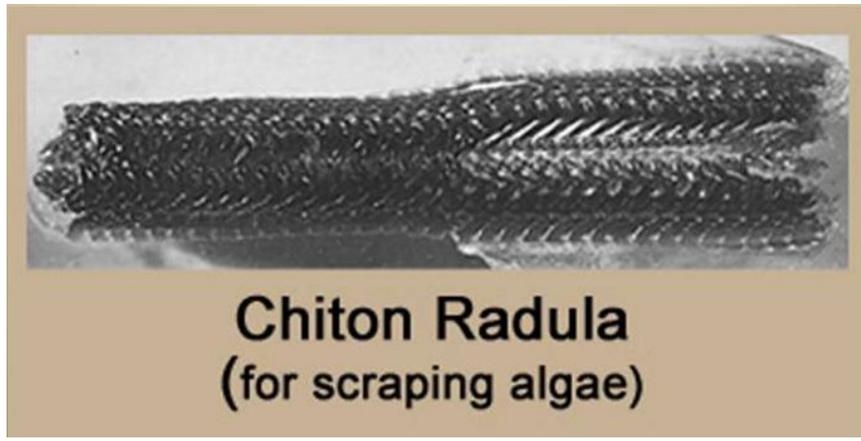
However, it is shell #21 and the meaning is bordered in red. Both of these contradictions indicate that its meaning is not in the Name and Appearance category after all. Instead, #21 falls into the Behavior category where meanings are based upon the anatomy and behavior of the animal. This was a clue that there is more to this *testiculus* than just its name :-)



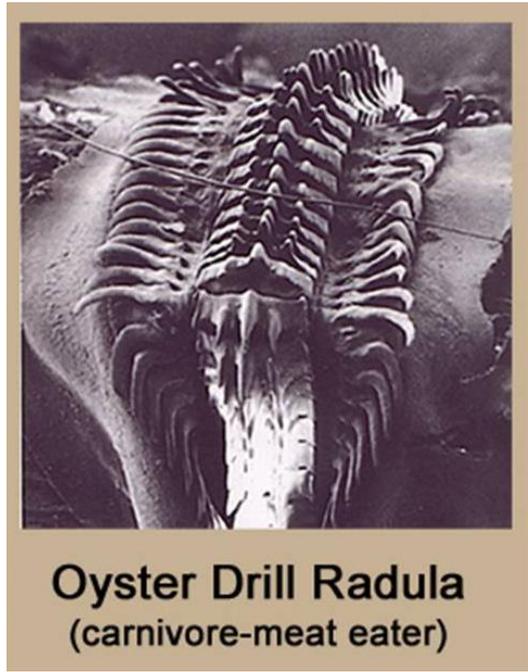
That is when I told you that many years later, I found this picture showing the testiculus mollusk is brave enough to walk up to a sea urchin and remove its spines before consuming the urchin. This is a feat not too many mollusks would consider undertaking. The photo confirmed that this shell is connected to the concept of courage not just based upon its appearance and its name, but by looking at the mollusk's behavior as well.

Since you were able to look at one mollusk's preferred method of dining, I thought we should continue this investigation by learning about other mollusks' feeding habits.

Let me begin by teaching you about the radula. This is a ribbon-like tongue and teeth structure that most mollusks (except the bivalves) possess. Depending upon the method of feeding, the radula varies greatly in the arrangement of teeth protruding from its surface. To demonstrate, let me bring back another friend.



Let's revisit the chiton ...the mollusk with 8 shell plates that suctions onto rocks. You just learned they are also called Polyplacophora. Chitons are vegetarians that graze on algae. They feed through a rasping action, and to accommodate this, their radula resembles a file. This arrangement permits the chitons to slowly scrape away at the algae in their environment. To the left, is the radula from a chiton.

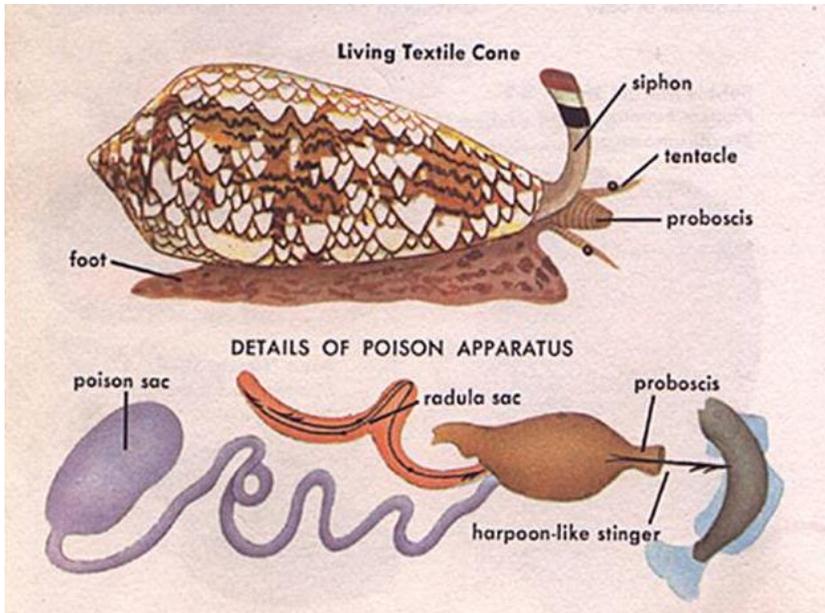


Here is another radula. This belongs to the Oyster drill. You can see the teeth on this radula. Oyster drills are carnivores. They use these teeth to drill through another shell and devour the meat of the animal inside.



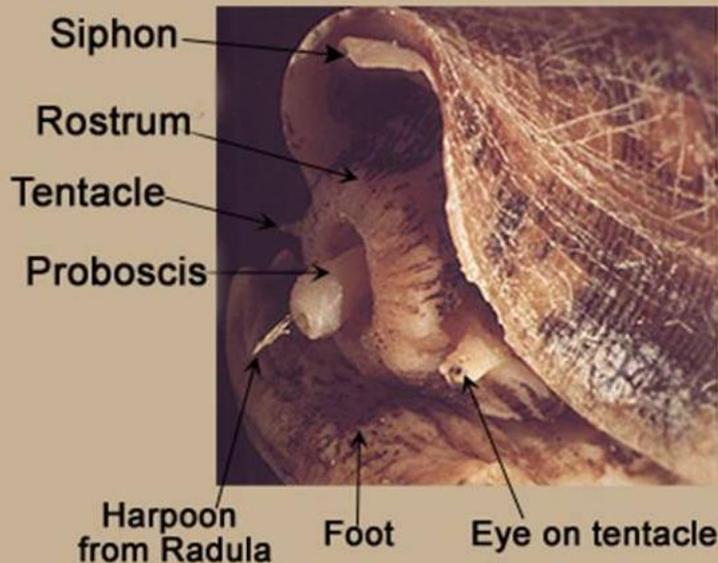
Harpoon-like tooth

Now, imagine that instead of a row of teeth, all these teeth are merged into a structure resembling a harpoon such as this tooth on the left. You have arrived at the radula of Cone shells. These harpoons are stacked single-file in the radula, and as one is used, the next takes its place. The cone manufactures new supplies all the time. To understand the purpose of this harpoon, we need to take a closer look at the anatomy of the cone mollusk.



If you study the cone anatomy in the picture to the left, you will note that cones have a saliva gland in their head that has been transformed into a reservoir for poison. There is a tube connecting this poison to their harpoon-like teeth and through this apparatus, these mollusks are able to inject venom into their prey.

Cone Mollusk with harpoon ready to launch



This picture to the left amazed me because you can see the harpoon ready to launch. The poison is similar to snake venom, and functions like a neurotoxin. Once it is injected, the prey is unable to mount any kind of coordinated response. This is followed by a systematic shut down of each internal organ. You would not think a snail could eat a fish, but if that fish were paralyzed, it could. The next picture is evidence of this.



Here you can see a snail eating a fish. After it injects the harpoon, the proboscis at the base of the barbed harpoon allows the cone to retract the fish back into its mouth where it can swallow the fish with the harpoon still intact. The cone then expels the inedible components of the fish as well as the used harpoon. This meal will satisfy the cone for a few days while a new tooth takes its place at the front of the radula, and the cone is set to hunt its next prey.

Thanks to You Tube, I can improve upon these still pictures. I was able to find a video of the cone in action. I am including the website for you to check it out.

<http://www.youtube.com/watch?v=BMOSvz5mThM&feature=fvw> 2:42 [Cone mollusk in action](#) from National Geographic

<https://www.youtube.com/watch?v=I2kbd11P2PI> 2:59 [Cone snail system for delivering toxins](#), and scientific method for collecting toxins for research.

All cones have this delivery system, but depending upon what they eat, the poison differs in toxic strength. Some cones eat tube worms, and their poison is not very potent. On the opposite extreme, cones that eat fish require a fast-acting powerful toxic agent, and they are capable of killing a man.

<https://carnegiemnh.org/cone-snail-toxins/> [Fascinating article on the evolution of Cone Snail toxins](#) "The venom cocktail targets particular kinds of prey; worm-eaters have a different suite of peptides than fish eaters. At different stages of development, they can express different genes. When very young, the fish eaters are too small to eat fish, so they eat worms, then switch to fish later. Their venom cocktail changes from worm toxins to fish toxins when they switch prey."

<http://www.youtube.com/watch?v=xmDuk3fnqc&NR=1> 1:28 [Textile cone hunting snail and geography cone with fish](#)

<http://www.youtube.com/watch?v=UHiGuquJmpE> :15 seconds [Net hunter](#)

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4621268/> [Detailed article on fish-hunting strategies for cone snails.](#) For those interested, feel free to scroll through and compare the three methods using pictures for each: "Thus, there are at least three different types of behaviors observed so far, which are associated with fish hunting, which we will refer to as the "taser and tether", "net engulfment" and "strike and stalk" strategies."

<https://www.ncbi.nlm.nih.gov/books/NBK470586/> [Article on cone snail toxicity](#)



This is a picture of the Textile and Geography Cone shells, created by two of the deadliest cones. Between them there are dozens of cases of fatalities to man.

http://penelope.uchicago.edu/~grout/encyclopaedia_romana/aconite/geographus.html
[History of geography cone conotoxin studies](#)

When it comes to interaction with humans, there may be no stronger interaction than to cause death. Based upon this knowledge, the **Textile Cone, # 80** in Ocean Oracle, means "Death, transformation, eliminating baggage no longer needed." Sometimes, transformation involves the death of a former way of being.

Since I am seeking to educate you about the animals as well as the shells, let me mention their location. Worldwide, there are more than 600 kinds of cone shells found mostly in tropical waters around the Pacific. The waters around Hawaii, the Philippines, Australia, and Africa are homes to the dangerous varieties. Although the shells are beautiful, there is no safe way to handle them. Some people claim you can grab them by the shoulders (the widest area at the top of the shell) and watch for the harpoon. If they see the radula appear, they drop the shell. I don't think that is something I would recommend. The harpoon can penetrate through pockets, gloves, wetsuits, and divers can be killed by placing a live cone in a collection bag. The safest approach is to admire from a distance.

It turns out that geography cones are among the deadliest. One on-line source states that a single geography cone contains venom strong enough to kill 700 people in theory, and has been referred to as the cigarette snail because you barely have time to smoke a cigarette before you die. Here are two sources with that cigarette snail reference:

<https://www.nist.gov/news-events/news/2017/10/how-cone-snails-deadly-venom-can-help-us-build-better-medicines> Source of quote below:

"The deadliest cone snail is thought to be the "cigarette snail" of the Indo-Pacific, a snail roughly the length of a man's thumb that can deliver a toxin so strong that you'd only have time to finish one cigarette before dying from its attack."

https://en.wikipedia.org/wiki/Cone_snail source of quote below (scroll down to relevance to humans/risks)

One of the fish-eating species, the geography cone, *Conus geographus*, is also known colloquially as the "cigarette snail", a gallows humor exaggeration implying that, when stung by this creature, the victim will have only enough time to smoke a cigarette before dying.

With such danger in their sting, it might seem advantageous to rid the planet of these cones. However, as usual, there is more to this story.

Amazingly, scientists discovered that by altering the venom of geography cones just a little, it serves medicinally for those patients suffering from tremors. Remember this venom affects the nervous system causing a paralyzing action. Apparently, the paralyzing action of the venom counteracts the shaking.

If you look at the **Geography Cone** in Ocean Oracle, you will see it is **shell # 76**, in the Interaction with Man category. Its meaning is "*Putting past negative behavior to positive use*". The interaction of this cone with humans is the conversion of its poison into medicine.

How might this meaning apply in a shell reading? This would be similar to a criminal who reforms and uses his knowledge to assist the general public in protecting itself from other criminals. Only someone who had the experience of burglarizing, and who interacted with other burglars, would be able to provide the inside information necessary to protect people from attempted burglaries. That is clear, but how often are you going to come across a burglar in a shell reading?

For another example...let's look at therapists. Often, the best therapists are people who have been through the traumas of life. This gives them a unique vantage point. Having personal experience enables the therapist to recognize that a client's thought process may not be logical at all. Without that experience, the therapist would be looking at circumstances through distanced logic, and would never realize that the mind does not function logically in these situations.

One more example, very close to turning poison into medicine...some of the finest doctors and medical researchers have entered that profession because of a personal brush with illness. Geography Cone is all about living through difficult and negative times in order to apply that knowledge for beneficial purposes. Just as the cone's lethal poison, a potentially negative thing, can be used medicinally. Who is better at infiltrating crime than someone with insider knowledge? Who is better at counseling people in pain than someone who has lived through a similar painful experience? In each case, they serve effectively because they are people who have walked a mile in those shoes.

There are times that tragedy motivates us in ways nothing else could. There are needs that are unrecognized until someone who can do something about it joins those who are suffering. That person becomes the strongest advocate for change that a cause could have. Just look at the founder of Mothers Against Drunk Drivers for instance. Candy Lightner lived through the horror of losing her 13-year-old daughter who was killed by a drunken hit-and-run driver. She later wrote, "I promised myself on the day of Cari's death that I would fight to make this needless homicide count for something positive in the years ahead". To add to her suffering, Candy watched the driver receive a lenient sentence. She channeled her grief and anger into the energy required to create a national movement...MADD. Working tirelessly, she educated the public regarding the serious nature of drunken driving and lobbied to promote tougher legislation.

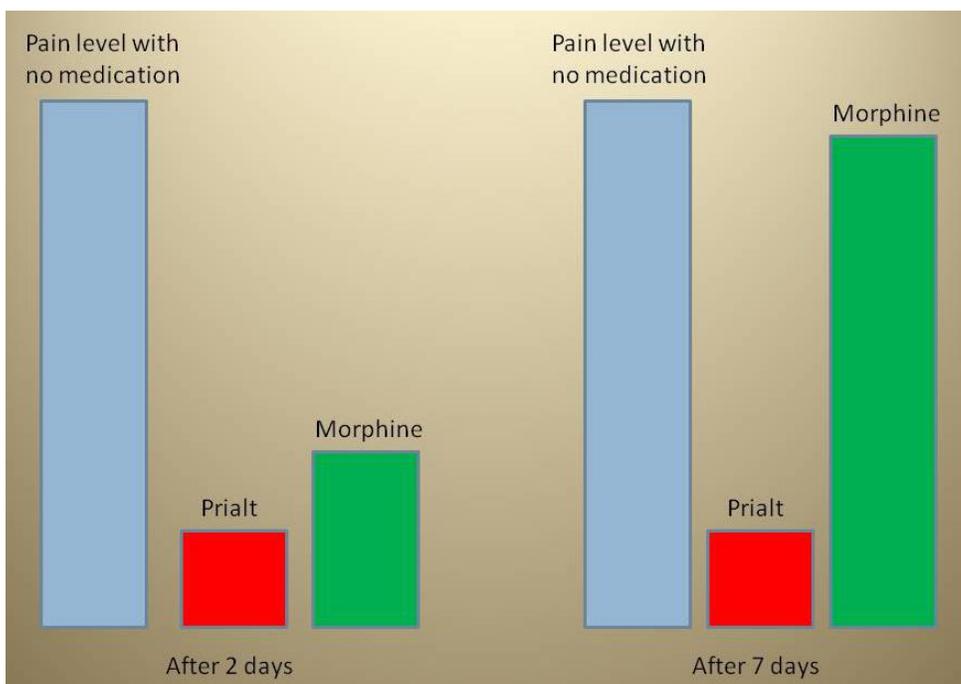
Once scientists discovered the medicinal potential of these conotoxins, the term they use for cone shell poisons, they began investigating in earnest. As the years progressed, I followed this with great interest. They learned that these poisons are cocktails of proteins. In January 2004, following clinical trials, scientists announced that one of the proteins in the magus cone was found to be a very effective pain killer. It was capable of giving relief to cancer and AIDS patients who could no longer take morphine. In 2005, Newsweek Magazine released a special edition called Your Health in the 21st Century. In this issue, there is an article called Pharmacy Island. It is reported that a drug called Prialt, the brand name of Ziconotide, provided relief for patients suffering from chronic back pain. Ziconotide is from the toxin of the cone snail species *Conus magus*. That is the scientific name for the Magus Cone, also called the Magician Cone.



You won't find this shell in Ocean Oracle because I did not have one when I wrote that book. However, I promised you cutting edge information, taking you beyond Ocean Oracle. I have a Magus Cone now, and you can see it in this picture to the left.

As William Underhill, a Newsweek reporter, states in an article from November of 2005: "*Conus magus... One dose of its venom can paralyze the passing fish that make up its diet. To drugmakers, though, the potency of its toxin is sheer poetry. Scientists who recently broke down the poison discovered--and copied exactly--a chemical compound that blocked nerve cells from sending signals to the brain. Result: [Prialt](#), a new painkilling drug 1,000 times more powerful than morphine, the most potent analgesic now available to medicine.*"

There is another reason Prialt is so exciting. In addition to being 1,000 times more powerful than morphine, it is not addictive. To help you appreciate what this means, let me demonstrate with this chart.



The blue column on the left represents the level of pain without medication.

After 2 days, you can see the reduction in pain using Prialt (represented by the red column,) and with Morphine (represented by the green column.)

One week later, look at how much Morphine is required to reduce the pain. But notice that the amount of Prialt is exactly the same. It is not addictive!

We have students with all different backgrounds and interests in this class. For any scientists among us, here is a wonderful in-depth 3-part series of videos covering the discovery of Prialt:
(Each portion is 21-25 minutes long. If you prefer a less scientific approach, please scroll down on this transcript.)

<http://www.youtube.com/watch?v=3Us-Zn5JfVA&feature=relmfu> Part 1...23:41 [Cone Snail Peptides](#)

The story of the development of Prialt by Toto Olivera, the professor in the lab at University of Utah where the research was done. (This video is almost 24 minutes long...If you focus on 18-23 minute mark, you will get an explanation for how Prialt works to alleviate pain even better than morphine)

<http://www.youtube.com/watch?v=MyuznQcqE8E&NR=1> Part 2...21:32 [How a Fish Hunting Snail Captures its Prey](#)...How cone mollusks use Combination Drug Therapy

<http://www.youtube.com/watch?v=gFVAtS8p4B4&NR=1> Part 3...25:37 [Conus Peptide Genes a "Drug Development Program"](#) Even more detailed science on genes and proteins leading to the development of drugs for intractable pain and epilepsy.

Remember when I said there may be no stronger interaction with humans than to cause death? Well, how about to cure disease?

In December 2004 the Food and Drug Administration approved ziconotide/ Prialt when delivered as an infusion into the cerebrospinal fluid using an intrathecal pump system. (Students, please note this drug is **not** available through your local pharmacy. It can only be administered in a hospital since it is injected into the spine.)

The wonderful news is that Prialt is a "synthetic". This means that scientists are able to mimic the conotoxin by replicating this protein in their laboratory. No cones are harmed in the process of making this drug.

<http://www.telegraph.co.uk/science/science-news/3349039/Snails-venom-signals-a-pain-free-future.html> If no longer available, the quote below is from this site:

12:01AM GMT 14 Nov 2006

A powerful toxin gives new hope to the millions who suffer from nerve pain.

"The study dealt with what is known as neuropathic pain, which is chronic pain due to injury to the nerves, spinal cord or brain. Such pain can result from diabetes damage to nerves in the feet or elsewhere, spinal injury, degenerative disc disease, alcoholism, failed low-back surgery, tumours compressing nerves, spinal tumours, repetitive motion disorders, multiple sclerosis, infection, stroke, traumatic brain injury, shingles, nerve toxins and electrical or other damage to peripheral nerves. "

In shell divination, the meaning of the Magus Cone is about issues of judgment. Had an early judgment been made to rid the planet of these dangerous cone mollusks, we would have eliminated access to a powerful medicine we are only just beginning to recognize.

In a 2003 paper published by the journal SCIENCE, researcher Eric Chivian of Harvard University in Cambridge, Massachusetts wrote, "To lose these species would be a self-destructive act of unparalleled folly. Tropical cone snails may contain the largest and most clinically important pharmacopoeia of any [group of animals] in nature."

[http://www.theage.com.au/news/creative--media/painkiller-comes-out-of-its-](http://www.theage.com.au/news/creative--media/painkiller-comes-out-of-its-shell/2005/07/24/1122143728598.html)

[shell/2005/07/24/1122143728598.html](http://www.theage.com.au/news/creative--media/painkiller-comes-out-of-its-shell/2005/07/24/1122143728598.html) [Article on Bruce Livett and conopeptides](#)

Cone shell protein fragments called conopeptides are arousing great scientific and commercial interest because of their potential to quell chronic, severe pain resulting from nerve injury or inflammation, post-surgical pain or "phantom limb" pain in amputees, painful leg ulcers on diabetics, or the intense pain of terminal AIDS or cancer.

Professor Livett says: "Some conotoxins are at least a thousand times more potent than morphine as analgesics, and some may be up to 10,000 times more potent, molecule for molecule. But they're non-addictive."

*Unlike morphine, he says, which acts throughout the body and brain, the conopeptides do not travel through the central nervous system, so they can be used at very low concentrations and still reach the **areas of pain**.*

.....

Last year, Melbourne biotech company Metabolic Pharmaceuticals provided a cash injection by acquiring commercial rights to Professor Livett's magical molecule, code-named ACV1 (Analgesic Component of Venom), and confirmed its potent analgesic powers in preclinical trials. Chronic nerve pain is currently treated, inadequately, with high-dose conventional analgesics such as aspirin and codeine, or anticonvulsants such as Neurontin.

Side-effects from chronic use of such drugs include digestive-tract damage, constipation and dependence.

Elan's Prialt omega conotoxin now offers a superior alternative, but must be injected into the spine because its by-play with receptors in artery walls sends blood pressure soaring into the red zone. Injected beneath the skin, or into muscle, ACV1 quells chronic neuropathic pain with no effect on blood pressure.

(More on conotoxins and ACV1 from June 2005)

<http://www.sciencedaily.com/releases/2005/06/050612111523.htm>

[Molecular Miners Find Pain Relief Drugs From The Sea](#)

1/30/13 - Patent Issued for Cyclised Alpha-Conotoxin Peptides

The research continues as scientists await the next medical conotoxin breakthrough.

Hold the presses....

Here is more information on Conotoxins I learned that there is someone in my neighborhood here in Georgia who visited Shepard Spinal center for inserting a conotoxin pump to treat her MS. She told me of another person who has been using the pump for years and could not walk without it. It appears the future is now :-)

To share a quote from her email.... *"I had a trial treatment with a needle directly into my spine and had to see which dose worked the best. Now, I am waiting to get surgery scheduled for a metronics pump to be implanted. So excited, love those sea snails!"*

The lesson of the Cone shell arose in my life at the start of my career as a shell reader. While seashell reading was merely a hobby, I was once a nutritionist working for a weight loss center. The owner was absentee, and due to low revenues, she had cut my hours back to four per week. I had grown close to my clients, and did not want to cancel our appointments. My solution, which my manager did not seem to mind, was to put in a full week and simply fill out my timecard for four hours. This did not cheat the owner, and I was able to continue working with my clients. Problem solved, until suddenly my world came crashing down. Overnight, the owner sold the business and her territory as well. The employees received no advance notice and were expressly forbidden to open a similar business anywhere within this vast territory. To me, the owner's actions were a poison destroying my life. I was paralyzed, completely at a loss about what to do. In the midst of my panic,

someone suggested advertising my shell readings. I placed a small ad in a metaphysical journal, and was immediately asked to write an article. This led to a request for a radio interview and opportunities to work at psychic fairs. To prevent damaging my shells, I photographed them and found that photographic images worked just as well. Later on, this knowledge gave me the confidence to export the shells through a deck of cards with a companion book.

In hindsight, when the owner cut back my hours, I continued working anyway. It required a clean sweep, selling her territory, to completely remove any possibility for me to continue working as a nutritionist. What I judged to be lethal proved to be medicinal. Eradicating my current life had forced me to redirect my career and discover a new passion far more fulfilling than my life as a nutritionist. My quiet little shell-reading hobby finally became public knowledge. The “poison” might end an existing way of life, but also paves the path to something better.