

## **Lola and the Snail**

### **Parent Prologue**

Fears are an inescapable part of childhood. Hiding under the bed during a thunderstorm, asking Mom and Dad to check under the bed for a monster are examples of how children express their anxieties to us.

While it is important to soothe and comfort, we mustn't forget to teach our children how to manage their fears.

This story is about how an adult in my neighborhood, named Lola helped me to learn to comfort myself when I was afraid.

### **Snail Observations**

Like cats, Lola and I absorbed the sun's warmth as we sat on the garden bench. The delicious perfumes of flowers and the sweet fragrance of orange and lemon trees soothed me. A gentle breeze caressed my tears. There was peace now.

"Lola, have you ever been so afraid that you thought your heart would burst?" I whispered.

"Oh, yes. I have often been that afraid. Have you ever noticed my hands?"

She put her hands in mine, and I blushed with embarrassment. I hadn't really taken a close look at her hands before. They were balled up in what looked like a very painful fist.

"I was so afraid when I learned that I would never again hold hands with my husband," she said tearfully.

"Like you, I was so scared my heart was bursting. I needed to sit in my garden. I do my best thinking in gardens," she smiled and said, "The warmth and the breeze and the smells of nature heal the soul and the body. And by watching and really noticing how other creatures handle their fears, it helped me to cope with mine."

"It all began by watching snails. They are the most patient animals, and they have a lot to fear. Birds, dogs, people...everything and everyone must be very scary for them. And yet, they have managed to not lose their curiosity for what's around them," She whispered.

I was intrigued, "Snails are curious?"

"Oh yes, indeed, very curious. Let's go find one!" she exclaimed. "To find a snail, you need to think like one. If you were a snail, where would you hide from a bird? You need to think like someone small, someone voiceless and defenseless..." she said.

My mind started puzzling over this question as I looked at the garden. As I scanned the landscape, my perception changed. Instead of just seeing plants and pots and soil, I started to notice hiding places and ways to be concealed! I pointed out some overturned clay pots, and as I carefully lifted them up, I discovered quite a few snails hiding out.

Lola asked me to place the pot on its side on the grass. As Lola gingerly picked up a snail for me to examine, she pointed out a flat lid-like structure. "This is the operculum which means 'little door or lid'. This structure is attached to the animal's muscular foot and serves as a type of door, trapping moisture in and keeping enemies out. Closing the operculum tightly makes it more difficult for predators to turn a snail into their next meal."

She encouraged me to be motionless and quiet so as not to disturb them. We wanted to "see" how they reacted to the pot being moved not to us, she said.

After what seemed like hours (which was probably more like minutes), I said, "Lola, the snails are just hiding in their shells. They aren't doing anything else."

She gently asked. "When you play Hide and Seek, when you're hiding, are you hearing things, too? "

"Yes, I listen carefully to the sounds outside my hiding place so I will know when it is safe to leave." I said.

“What type of sounds tell you it’s safe?” asked Lola.

“Oh...not really a sound...but a quietness. Oh, and stillness! If I don’t feel the floor moving I know I’m alone. The quietness and stillness fills me and tells me I can leave.” I said.

“Do you think snails might do the same thing? Do you think they are also waiting for quietness and stillness to let them know when it is safe to leave their shell?” she asked.

“I suppose I need to be quiet longer.”

“Yes, she laughed. “We could wait just a little longer or we could think about what would help the snail to decide not to hide anymore.”

Lola was describing to me taxis responses, which is the movement of an organism in response to a stimulus such as light or sound. And taxis responses are innate behavioral responses. We are born with these responses, and they can be positive or negative.

“Hmmm...well, I come inside from playing outside sometimes because I’m hungry or thirsty.” I said.

“Let’s do an experiment. Could we create an environment that would attract a snail? And how can we learn about what is attractive to snails in the first place?” she asked.

“Maybe we should search for snails that aren’t hiding?” I asked.

“That is a very good idea. Let’s do some field work. We need to see how snails normally act in the garden.” She whispered.

Lola explained observation is the most fundamental of all scientific processes. Observation is the gathering of information through the use of any one, or combination of the five basic senses: sight, hearing, touch, taste, and smell. As she handed me a magnifying glass, she said that tools can be used to amplify our senses. A magnifying glass will allow us to see things that are too small to be detected with the naked eye.

She also emphasized that nature provides clues to the observant investigator. In the case of our snails, we followed their slime trails. We discovered snails everywhere! I was very surprised as I thought the needles of the cactus would be a barrier to snails. Lola said having a slimy body enabled snails to slip easily into tiny crevasses. And she also mentioned some slugs, like the Banana slug, have the fascinating ability to produce a slime cord, which allows the slug to descend from high places much like a spider dangling from a web.

I noticed that when a snail was alert and on the move, it had two pairs of tentacles protruding from its head. Looking at a snail with the magnifying glass, I saw eyes at the tip! When I touched them the tentacles retracted. Lola said this response was the same as blinking your eyes if someone came close to them with their finger. The smaller pair of tentacles below are used by the snail for inhaling fresh turned soil and plants.

What really shocked me was that the tentacles could move independently, allowing snails to look and smell in several directions at one time. Lola explained that curious snails would extend their bodies and tentacles whereas a cautious snail would retract them.

As Lola painfully opened her hands, she placed a snail and a thin piece of cactus on my magnifying glass. I watched as the snail grew inquisitive. Slowly, the snail extended its tentacles and body to better sense the cactus. Once the snail was on the cactus leaf, Lola encouraged me to slowly turn the glass over. This helped me to see the snail’s rasping tongue or radula. “Snails are gastropods, which is a Greek word meaning ‘stomach foot’. Snails have a broad flat muscular foot used for support and forward movement. This foot runs along the underside of the animal – essentially along its belly.”

Placing a smaller snail on top of the larger snail, she then asked me to close my eyes and just listen. A distinct rasping sound pricked my ears! “The sound you’re hearing is the smaller snails radula’s toothlets cleaning the larger snail’s shell’, she explained.

“How are you feeling, Belinda? You seem lighter, less troubled.”

“I do feel lighter! I don’t feel afraid anymore. I wonder why?”, I said

“As you can see, the snail is a beautiful animal. Many people let their problems weigh them down. I was weighed down by the loss of the use of my hands. Watching my garden snails helped me to adapt – to fit into my new environment. Snails don’t have hands, but they seem to get along quite well in life. Their slimy glue goo keeps the snail moving, not impeding (delaying) their movement with stickiness. And just like the snail, I have fears and sometimes want to hide in my shell, but my curiosity always causes me to come out and extend myself – to explore. In life, movement is the answer. Allowing what’s keeping us stuck isn’t,” Lola softly and kindly explained.

Since that day in the garden, I have reflected often on Lola’s wisdom. Emotional growth is an active process. When I am afraid, I look to the small things to discover my way back to peace. It has never failed me.

### Snail Observations Activities

#### Material:

- Magnifying glass
- Snail
- Snail puppet
- Paper plate

#### 1. **Management NOTE:**

- **Let your child know that they can touch the snails but they must be gentle. It is better to slide them than try to pull them off of a surface.**
- **Gloves should be worn when handling snails**

2. Tell your child that science begins with observation!

3. **Help your child put on some gloves (vinyl, nitrile, rubber gloves – type used for washing dishes).**

4. **Once Gloves are on, put the snail on the paper plate.**

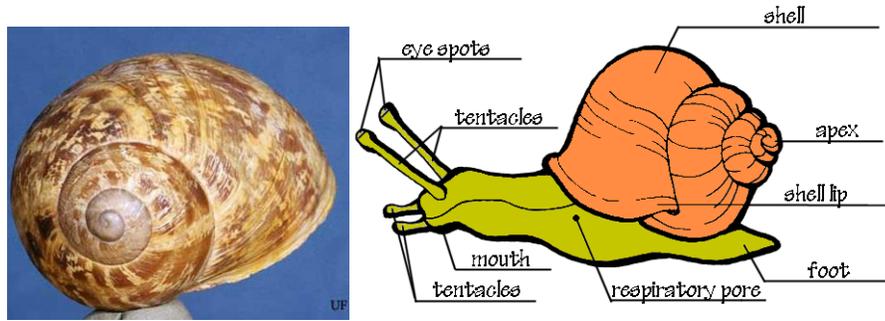
5. **Explain:** Gastropod means “stomach-foot” – an apt name for an animal that crawls belly-down on a single, muscular foot.

6. **Elaborate:** A snail is built like a spongy water tube toy, and this serves as a hydrostatic skeleton. Our muscles work by tugging on a hard skeleton, but molluscs don’t have bones, a snail’s muscle fibers coil and crisscross around its blood-engorged tissues. By contracting these in various combinations it can protrude parts of its body, curl up, turn corners, twist, and so on.

7. Ask your child to examine the shell and the bodies of the snail with their unaided eyes first, then challenge them to find additional detail with the help of magnifying glasses.

8. **Explain:** The shape or structure of a shell is predestined by inheritance, that is, the mineralized outer structure is species specific. The mantle is a blanket of soft tissue that covers a snail’s body like a bathrobe. (In days of old, a “mantle” was a sleeveless cloak that people draped over their garments). The mantle has a very important function: it creates the shell. The mantle contains cells which produce an external organic matrix that is rapidly mineralized with calcium carbonate. It is the presence of calcium carbonate that makes the shells hard. There is a variation in degree of mineralization. Daily increments of matrix with mineral are formed, the thickness and rate is controlled by a variety of physiological and environmental factors. The shells can grow and repair fairly quickly. A shell with a crack can be repaired within a few days. Shells reach their adult size within 1 to 6 years, other species grow throughout their lifetime. Each shell species continues to add shell depending on the nutrients in the environment. Some shells

grow with a steady process while others grow at intervals. The end product is a unique and beautiful structure often with external patterns and different colors.



9. Ask your child to share what they have observed.
10. Reinforce the vocabulary presented earlier, i.e. tentacles, foot, shell, mouth and radula, throughout the workshop.
11. Encourage your child to examine shell shape, color texture, size, and using sense of sight and of touch.
12. Ask them to note some behavioral responses of their snails. For example, the withdrawal of the tentacles and eye, etc.
13. **Tell:** Look for sensory tentacles at the anterior end.
14. **Explain:** These carry mechanoreceptors for touch, chemoreceptors for smell/taste, and simple eyes at the tips, with photoreceptors to detect light, shadows, and movement. Examine a tentacle and eye under magnification. An interesting thing to do is to (gently!) touch its eye. What was the reaction?
15. **Elaborate:** When you touched your slug or snail's eye, it probably retracted its tentacle. After a few seconds it probably telescoped back out. The motion is similar to turning a sock inside out, but driven by hydrostatic pressure, like squeezing one end of a tube of toothpaste or blowing into a curly New Year's Eve horn. This way of moving is a specialty of molluscs, made possible by their boneless, blood-filled bodies. We have a closed circulatory system, meaning blood is pumped through pressurized pipes (arteries). Gastropods, by contrast, have an open circulatory system. Although they do have a few blood vessels, blood mainly reaches their cells by soaking into open spaces (called "sinuses") within their tissues.
16. **Ask:** How does a snail protect itself?
17. Point out that the garden snails' defenses against predators include cryptic coloration and texture; thickened shells and aperture barriers; defense mucus production including irritating smells and tastes; hiding behaviors, and rapid withdrawal or dislodging movements.
18. Let snail crawl on the magnifying glass and look at the underside of the snail. Find the pneumostome (breathing hole).

### Tracking Snails: Citizen Scientist Project

#### Materials:

- White Out, or Sharpie marker or brightly colored nail polish
- Notebook
- Pen

#### Procedures:

1. **Ask your child:** Have you ever wondered where snails go at night? Did you know snails can travel distances of up to 82 feet in a day? Do you think snails can find their way back to their homes?
2. **Discuss:** A homing instinct helps an animal to return home after travelling great distances.
3. **Engage:** Let's do some field work! We need to think of a way that we can track individual snails.
4. **Ask:** What if we paint a unique number on each snail? This is called "tagging".

5. **Explain:** We can note where the snail has started in the yard, and look for where the snail is the next day. Hopefully, we will be able to solve the mystery surrounding snail activity and maybe it will be useful information for gardeners. Let's go find some snails!
6. Once the snails are found, your child should put a unique number on the shell. They should note where the snail was found and the date/time.
7. Over the next few days, encourage your children to keep an eye out in the garden to see if they find any snails with their "tags". They should write in their notebook the location of the snails. It might be helpful to make a garden map. (We will have that activity soon for you!)

### Open Ended Investigation

8. What time of day did label the snails?
9. How many of them returned? Did you check at the same time of day?
10. Is there a time of day that snails are more likely to be at their "home"?
11. Did you find that more snails returned to the place where you labeled them than did not return?
12. Does this support the idea that there is a homing instinct?

### Resources

- **Snail Mucus Dagger:** <http://blogs.discovermagazine.com/inkfish/2015/03/13/being-stabbed-with-a-mucus-dagger-is-not-even-the-worst-part-of-snail-sex/#.VfxWvN9Viko>
- **Why Some Metazoan Mucus Secretions are More Susceptible to Microbial Attack than Others:** [http://www.jstor.org/stable/2460295?seq=1#page\\_scan\\_tab\\_contents](http://www.jstor.org/stable/2460295?seq=1#page_scan_tab_contents)
- **Snail Bubble Rafting Evolution:** <http://www.livescience.com/16476-bubble-rafting-snail-evolution.html>
- **Citizen Science Reveals Unexpected Continental-Scale Evolutionary Change in a Model Organism:** <http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0018927>
- **Bizarre Creature Discovered Miles Under the Ocean:** [http://honesttopaws.com/scaly-foot-gastropod-snails/?as=5EH1&utm\\_medium=social&utm\\_campaign=postplanner&utm\\_source=facebook.com](http://honesttopaws.com/scaly-foot-gastropod-snails/?as=5EH1&utm_medium=social&utm_campaign=postplanner&utm_source=facebook.com)
- **Survival of the Sluggish – Scientists Find an Upside to a Low Metabolism:** <https://www.npr.org/2018/08/24/641623213/survival-of-the-sluggish-scientists-find-an-upside-to-a-low-metabolism>
- **Spectacular Macro Details Reveal the Intimate Life of Snails:** <https://mymodernmet.com/vyacheslav-mishchenko-macro-snails/>
- **Snail 99 Million Years Old Stunningly Preserved in Amber:** <https://www.cnet.com/google-amp/news/snail-thought-to-be-99-million-years-old-found-preserved-in-amber/>
- **Harvesting Snail Slime for Beauty Products:** <https://www.facebook.com/greatbigstory/videos/1948482605454163/>
- **Chitons Can See You:** <http://www.eartharchives.org/articles/chitons-can-see-you/>
- **Some Snails Wear Jackets Made of Algae to Protect Them From the Sun:** <https://www.newscientist.com/article/2191791-some-snails-wear-jackets-made-of-algae-to-protect-them-from-the-sun/>
- **Carrying the World – The Environmental Burden on a Snail's Shoulder:** <http://www.eartharchives.org/articles/carrying-the-world-the-environmental-burden-on-a-snail-s-shoulder/>
- **It's a Lefty! Welcome to the World's First Crispr Snail Baby:** [https://www.nytimes.com/2019/05/24/science/snails-lefties-crispr.html?fbclid=IwAR2epN9IEa2C4FTp9U\\_6-KH3FdSE4DIKGd4slAPkDulpOjHL8CVLx4TCi6A](https://www.nytimes.com/2019/05/24/science/snails-lefties-crispr.html?fbclid=IwAR2epN9IEa2C4FTp9U_6-KH3FdSE4DIKGd4slAPkDulpOjHL8CVLx4TCi6A)
- **Goodbye, Snails:** [https://www.theatlantic.com/video/index/594067/snails/?utm\\_content=98029516&utm\\_medium=social&utm\\_source=facebook&hss\\_channel=fbp-212009668822281&fbclid=IwAR3SH4fexWtliN3JsFCL3xet09oOXh3AupEoL6cVDDQ6Zmrci8RKZ99N0js](https://www.theatlantic.com/video/index/594067/snails/?utm_content=98029516&utm_medium=social&utm_source=facebook&hss_channel=fbp-212009668822281&fbclid=IwAR3SH4fexWtliN3JsFCL3xet09oOXh3AupEoL6cVDDQ6Zmrci8RKZ99N0js)

### Vocabulary

- **Eyespots:** Located at the tips of the long tentacles on land snails
- **Foot:** The soft, muscular part of the snail that allows the snail to move
- **Head:** The front part of the snail, containing the tentacles, eyes, and mouth
- **Homing Instinct:** The inherent ability or innate instinct of certain animals to return home, after being released (sometimes from great distances)
- **Mantle:** Portion of animal that has specialized functions related to shell formation
- **Mollusk:** a member of the phylum Mollusca, a group of invertebrates with soft bodies often enclosed completely or partially by a mantle and a shell. Snails, clams, octopuses, chitons, slugs and nudibranchs are molluscs
- **Mouth:** On the underside of the head - it contains the radula, a file-like tongue that breaks down the snail's food
- **Radula:** The file-like band of teeth that snails, chitons and many other molluscs use to scrape, tear and bore
- **Shell:** The hard, spiral, protective covering of the snail
- **Taxis:** A body movement in which an organism achieves a specific orientation to a stimulus source
- **Tentacles:** Two long and two short sensory tentacles on the upper surface of the snail's head