

Battle of the Bugs



Dr. Diane Marsh

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Cover and back page design by Cole Marsh and Gio Brigola.

Dedicated to my Mother and Nephew. Our games of Dungeons and Dragons inspired me!

Battle of the Bugs by Diane Marsh

- Science topics include the chemistry of beeswax, honey, and pheromone isoamyl acetate.
- Story Description: *A group of young teens go to a science camp to compete with other teams on applying their math and science (STEM) skills. After learning what they need to know during the first week they have a chance to take on a greater challenge to save the bees to benefit the Earth. Will they accept the challenge and succeed in their quest?*
- Prologue: John Mayor looked over the file in front of him. The quantum link had been very successful for Michael, one of the applicants for his "camp". The situation with the bees was growing critical, if something wasn't done soon it could result in a world food crisis--- in both worlds.

Character Biographies

Cole Myers:

Short for his age of 13, slim and strong. Large blue eyes. Smart and wiry, quick and clever.

Father high school biology teacher who studied entomology who died in an auto accident when Cole was 11. Cole is grieving the loss of his Father.

Mother cleans houses, lives in a small apartment, has health problems. Mother is also a free lance writer.

Loves bugs and has thief experience from getting food.

Luella Pierce:

Long blond hair and freckles, brown eyes, tall and slim, 14.

Prefers casual clothes, sometimes called Lu.

Divorced mother works at a Health Food store. Dad builds solar houses.

Has a three year younger sister name Francine (Frannie).

Eco friendly.

Loves health and plant biology. Psychology feeds her interest in people.

Luella has trouble saying no to her friends, so does things she does not want to do.

Peabo Grant: named after Peabo Bryson

African American, 14 years old

2 older sisters (Lucinda, Therese)

Dad is a dentist, Mom is a realtor.

Tall and very fit.

Loves math and physics

Peabo is not trusting of people and introverted. Does not think that most people are doing the best that they can.

Michael Pak, 13 years old

Dark black hair and eyes (Eurasian). Slim build.

Chatterbox, loves to talk. Michael tends to talk first, then think after, so makes some blunders and does not keep secrets well.

Father is a physician surgeon, Mother (née Meyers) is an artist. No siblings.

Story overview: Four seventh graders enter a summer adventure camp which becomes a portal to the beehive of a parallel universe. The team must use their math and science skills to secure the portal in order to save the BEES in the bug world and their own world before they return home.

Group faces challenges and learn about science and themselves.

Battle of the Bugs

Chapter 1: Cole, the Thief

Hunger rumbled through Cole's gut like a thunder storm. Short for his age, but wiry and strong, his large blue eyes seemed to draw any observer's attention. Since his Father had died in a car accident, Cole's Mother had been working many hours cleaning people's houses but did not make much money or have good health insurance. Her free lance writing work did not earn enough to live on. It was like their sense of purpose was gone. They kept trying to steer their boat thru the waters of life without any rudder.

Cole did yard work and delivered papers to help, but there was never enough food in the house by the end of the month. It was always a struggle to pay the rent for the tiny apartment where they lived.

During the school year getting enough food wasn't such a problem. Cole got a free breakfast and lunch through a program. Being smart and nimble, quick and clever, Cole had discovered another way to get some food. His conscience pricked him when he was forced by hunger to do it. He was very careful only to steal lunch bags from kids with plenty of money. Often he took them from careless kids who "lost" them on the bus or on the playground before school began. He had only been suspected once or twice and then he talked his way out of it. He hoped that next year, it wouldn't be harder to get enough to eat.

Now that it was summer, no meals were provided. Cole's Mother had needed some medicine and missed work due to an illness. Cole decided he better go check out the park to see if he could find some unattended food. The park was chaotic with many

people engaged in activities. Cole recognized many of the kids from the school and felt sad and lonely. "I don't have time to be a kid right now. I have to help Mom out." At one end of the park under shady trees surrounded and isolated by bushes there were several picnic baskets on blankets. Cole found one abandoned and isolated where no one could see it very well. Carefully he approached the basket after searching the surrounding bushes for the owners. There were two boys-one very slender with short, dark colored hair, the other was larger, black, muscular with a sturdy build---and a girl with freckles and a blond pony tail about his age facing the opposite direction. They were apparently watching some baseball in the field. He snuck up and took out a sandwich and some fruit. As he lingered to decide whether to take a few cookies too, the three kids quickly turned to face him. "See, I told you could get an accurate vision", said the small boy to his two friends. "Soorry" stammered Cole, "I was just really hungry.". "Hi, I'm Michael. Why don't you stay and have lunch with us. We have plenty."

As they sat around eating lunch Cole got to know his companions. The large, very athletic looking boy was Peabo. Cole had seen him at school because he was in almost any sporting event they had and he was the leader of the math club. The girl was Luella, she was quiet, happy and peaceful. Somehow Luella made you feel comfortable just by being near her. Michael was the leader of the group, everyone looked to him to start the conversation.

"I've seen you around school Cole. I remember you won the maze puzzle contest in math class. You don't seem to hang out much with anyone." Cole considered his

answer, something told him to be open with this group. "I have to work after school because my Mother and I don't have much money, so I'm never able to stay for activities. During the school day I have to get all my homework done too. I think most people just give up on trying to be friends with me because I'm too busy." Michael considered this and suggested, "Maybe we could help each other out here. We have just heard about a Science Adventure Camp that takes teams of four kids for the last two weeks in August. The flyer says they have a scholarship program and will provide \$500 plus all food and board for the two weeks for anyone who has financial need. We have been looking for a fourth person to join our team so that we can all apply." Cole could hardly believe someone would pay to feed him for two weeks. "Is this for real?"

Luella got out a flyer and application form. "See here is the flyer and the bottom of the form is for the scholarship part." Luella gave Cole such a sweet, encouraging smile, he began to feel like everything would work out fine. Cole saw that the program was sponsored by the town's most eccentric citizen, Johnston Mayor. He had a huge estate, all fenced in with a private lake. Evidently he hosted four teams of four kids for a camp each year for a competition that he set up on his estate. The flyer said "The best team will combine science and math knowledge, physical abilities, ingenuity, and other talents!" Peabo said to Cole, "You were great at the obstacle course in PE last year and you created a very clever puzzle for math class, I think you should join our team." Cole decided he might as well try, "OK, I'll ask my mother tonight. I don't have a phone, how will I contact you?" Michael said, "Let's have another picnic here tomorrow to plan." They all agreed to meet and talked about the camp for the rest of the meal.

Cole's Mother had a weary gaze from a long day. She put her feet up for a few minutes before heating their dinner of baked beans, rice, and carrots. Cole was glad he had eaten a delicious chicken sandwich for lunch, because they had this dinner too often to find it tasty. Her eyes settled on Cole's Father's collection of insects pinned and framed on the wall in front of her. "How was your day today Cole?" She wondered if Cole would ever be able to go to college to study entomology (he sure loved bugs!). He was still fascinated by the subject, even two years after his Father was no longer there to encourage his interest.

"Mom! I met some kids in the park today who want me to be on their team for Science Adventure Camp! The best part is that there is a scholarship program, so it wouldn't cost us anything. See the flyer?" His face was lit up with excitement, which had become very unusual. The program seemed like a perfect opportunity for Cole and best of all Cole had found some friends his own age. "We might as well apply Cole, what have we got to lose? I'll complete the paperwork while you heat our dinner. You will have to get a substitute for your yards and paper delivery if you get accepted."

After dinner Cole read from his library books, mostly about insects. They could not afford a TV, but he did not mind because he liked to read and draw pictures of the insects that he studied. There were a few nature shows he wanted to see, but that would have to wait. This evening Cole read about bees and how they produced honey from nectar.

Cole read, "Nectar gathered by the worker bees from many flowers is brought back to the hive where the workers mix it with an enzyme in their saliva called *invertase*."

Invertase makes the sucrose sugar in the nectar quickly break apart into the simple sugars glucose and fructose. The bees then evaporate off some water from the modified nectar by waving their wings. Thick, gooey honey results from this process."

When Cole paused from his reading all that he could think was, "Will I get to go to camp?". It was going to take some patience until he got the news!

Chapter 2: Magician Michael

Michael was arguing with his Father again ---about magic. Michael was the adored child of successful parents. His Father was a surgeon who firmly believed in science. He thought that Michael's preoccupation with magic was just "kid stuff" and he would outgrow it. "Michael, it is fun to believe that you have special powers when you are a kid, but you are old enough now to realize that it is just your imagination. I'm beginning to wonder if an Adventure Camp is a good idea. I suppose you think you will be using spells like in some video game?"

Michael knew he had to convince his Father that camp was the place for him. "Dad, I have three other kids counting on me and the Camp is a Science Camp too. It stresses teamwork and using your head to solve nature problems, so you should encourage me." "OK son", said his Father, "just don't get carried away with your psychic powers to see behind you. There is some scientific explanation---you probably just heard the kid behind you."

"I love science too Dad and maybe it does explain it all. The Camp will inspire me to learn more about it. My team and I are working to be prepared. I have focused on

chemistry. Luella is general biology and plants, Peabo is great at physics, and the new guy Cole is entomology." His Father noticed the strength of purpose and replied, "That sounds like a good experience to me. Let's do a couple of chemistry experiments in the basement lab after dinner tonight. We can make some banana scent compound for fun. Who knows, you might be able to use something at your camp."

Michael's Mother, the artist, called the two in for supper. "Mom, we found a great fourth team member for Science Adventure Camp today." exclaimed Michael. "Who is it?" said Mom. "His name is Cole Myers and he is a quiet kid in our classes, but he has won prizes for puzzle contests and the obstacle course. We met him at the park today and he really needs the scholarship money too. ". Mom responded, "Well it will be nice if he can go, we can help him out with some supplies too. Hmm...you said Myers was his last name? I had an uncle named Cole Myers, but we lost touch with him. I wonder if they are related to us? Sometimes families pass on a first name."

Michael had felt an almost magnetic pull toward Cole in the park. He knew that people did not believe in magic, but he could see a vision of his team competing at the Camp and knew that they would all be there soon. There was no explanation for the events that seemed to be happening to him. He had been drawn to the flyer, that had been covered by other flyers on the bulletin board at school. His friends Peebo and Luella had been perfect players for the challenges. He had focused his vision on where the fourth person would be found and it led to the picnic in the park. Now Michael was sure that Cole was the one that they needed to succeed.

Chapter 3: Strong Peabo

Peabo smiled in satisfaction as he lifted the weights. This was the most he had ever bench pressed and he wasn't too strained to try more next time. "I am turning into the Incredible Hulk", he thought to himself. Solitary time working out relaxed Peabo and recharged his "batteries". He liked all sports, but especially the ones that involved strategy and combat skills like the Martial Arts, archery, and fencing. He studied physics because it helped him learn how to apply forces in the most effective way. Beep, beep, beep ---his watch signaled that it was time to finish now and shower so he could change in time to meet the "team" at the park for lunch.

Everyone gathered at the meeting spot, excited because Cole had shouted "I can do it" as he ran toward them. They started making plans and dividing up areas to study in preparation for the big competition ahead. Peabo had put together a physical training program with fun ways to exercise that would stretch and strengthen their muscle groups. He had them all see who could balance longest on their right foot and then on their left. Peabo won the right, but Cole won the left. "I feel like such a wimp, I did worst on both legs."exclaimed Michael. Luella laughed, "I guess that you are doomed to be the brains of the operation. You better really hit the books!" They learned a Tai Chi routine to develop balance before sitting down to their picnic lunch. Luella had packed food using her knowledge of nutrition to maximize their strength and energy. she had written healthy diets guidelines out for them to follow. "Lots of fresh fruit and vegetables! And that does not mean potato chips and catsup guys. We won't be

running at our peak if we are eating a bunch of salty and sugary stuff." The boys all gave her frowns until they tasted the apple oatmeal bars she had made.

Michael asked Cole if he was related to Cole Myers, who used to be a doctor in the small neighboring town of Hargrove. "Yes! He is my grandfather, my Father's Dad. He retired about five years ago and he isn't very well now and has to live in a special home for people with memory problems. We don't get to see him very often because it is a long ride on the bus." Michael patted Cole on the shoulder saying, "We're cousins then, my Mother says that he is her uncle. Maybe we can all go out and visit him together this weekend. I think we were meant to meet in the park, it is a special type of magic where connections draw people together. You had better come over and meet my Mother sometime soon."

Cole was very happy to have a cousin and friends. He had felt quite lonely for a while now and needed to be part of a team. He had prepared some puzzles for the group to do after lunch. "I have to leave by 3 o'clock to pick-up and fold the papers for delivering the evening edition, so we will have a time limit." They found that the team was strong at number and word puzzles, but had more trouble with the ones involving shapes and mapping. "We had better work on this more, it may be very important to the adventure."

When Cole got ready to go, Peabo said, "It would be a great workout to all deliver the papers together. We could see how fast and accurate we can be." The team all agreed and it was great fun competing for the best toss and jumping over obstacles. But would they get selected to compete at the Camp?

Chapter 4: Luella's Healing Touch

Luella was happy to be able to sooth the scrape on Peabo's knee that he got while skateboarding. She had taken the first aid course at the YWCA earlier this year and studied to increase her knowledge. Luella was interested in everything to do with biology, health and wellness. Her mother worked at a Health Food store, so information about nutrition and herbal remedies were a part of her life. She loved finding out about people and their families and dreamed of being a psychologist. Luella kept a garden and experimented with plants, especially those native to the local ecosystem, so that she could study the insects that were attracted to them and repelled by them. Many plants had healing properties.

Luella looked forward to the Adventure Camp as a way to use her knowledge of biology, nutrition and healing to give her team an advantage. She realized that physical and mental exercise was part of the equation for good health. Peabo was her best friend and they did the fitness trail together every Saturday morning. This morning the two friends were conversing excitedly about being accepted to the Camp starting Monday as they completed the trail.

"Are you packed yet Peabo?"

"I can't decide what equipment I should take with me. If there is any fencing, I really prefer to use my own foil. I know it says they will supply everything we need, but don' t you think my Swiss Army knife would come in handy, for marking trails and stuff."

"Ha! You better check with the Camp. You know how they are about anything sharp at school. I had my sharp scissors for cutting bandages confiscated last year."

"I suppose I could call the information number and ask them."

Luella struggled to pull herself over the climbing wall.

"Let me show you a more efficient way to do that Lu. You are using more energy than you have to. We want to be able to show Cole and Michael that we are the best!"

"I am glad that Cole found his way to us. It must be so hard for him, still grieving the loss of his father. It was a nice surprise to find that he is related to Michael."

"Huff!", Peabo let out a big puff of breath after mastering the wall. He felt uncomfortable talking about feelings so just added "Cole seems like a good guy."

After more practice they were both satisfied that they were ready for the physical challenges of camp. Next Peabo had to get Luella's help learning to identify the healing plants in the local botanical garden.

"What would you use this plant for Peabo?"

"Ahh...Aloe Vera. I just break off a branch and smear the jelly like stuff on a burn. Right?"

"Yes! You are getting good." Luella smiled as she anticipated the challenges ahead at camp. She always approached life with a positive, cheerful attitude. Luella liked the chance to find out about new people and figure out what made them tick. Bring them on!

Chapter 5: Meeting Mr. Mayor and the Other Teams

The team had received their letters of acceptance and time had passed quickly because they stayed busy getting ready. Peabo's older sister was willing to take over

Cole's paper route and yard work for the chance to earn some extra money. All of them were in the best physical condition of their life. Information on science and nature topics kept whizzing through their brains. "My brain feels like a Thanksgiving turkey!", sighed Michael on the evening before Camp began.

Finally the day arrived and the families all collected to send the campers on their way. Four minivans in four different colors got loaded with the supplies. "We're the green team, green is for GO get them!", cheered Luella's little sister who took after her enthusiastic sister. It was a short ride to the large property on the outskirts of town. Huge gates opened to allow them to enter the fenced area with forested land on either side of a windy road. After ten minutes driving slowly through this wood, the vans came to a clearing showing a view of the main house, the lake, and four large log cabins with different color rooftops and trim. They stopped in front of the main house and the driver instructed them to get out of the van here. After they got out, the vans pulled over to the cabin with their matching color.

"Welcome Adventurers! This afternoon and evening is set aside for you to get familiar with your surroundings. For the next 4 days, starting tomorrow, you will have a chance to drill on the different challenges that await you in camp. Every morning you will have a three hour physical challenge session. After a lunch and rest break there will be a mental challenge session. This practice time allows your team the chance to work together and practice for the first round of competition. On day 5, 6, and 7 your teams will be competing with each of the others. The second week will be full of surprises!"

Mr. Mayor was no taller than Peabo and very thin, but he seemed very springy and full of energy. He had grey hair and eyes and a little bit of a mischievous smile. He addressed the four teams of four kids and invited each to sit at the table on the huge front porch that had their team color on its table cloth. Michael led the group to the green table. A cooler with a selection of beverages and assorted snacks awaited them on the table. Each chair had a team shirt with their name on it to help everyone get to know each other.

During the snack break the red team and the green team got to know each other. The boys all gobbled down sticky peanut butter and jelly sandwiches washed down with ice cold milk. Luella started chatting with a red haired boy with freckles named Hugo when she found they shared an interest in plant biology and "green chemistry". Hugo was on a team with three girls who were part of the gymnastics and track and field team at his school.

"I am going to have a hard time keeping up physically," sighed Hugo. "I have two left feet and get tripped up all the time. Let's talk plant science, then I will be happy."

"Of course our garden is totally organic, which means I spend a lot of time pulling weeds", said Hugo. "I do also use a mixture of vinegar, salt, and soap anywhere that it won't effect my crop plants."

Luella shared "Clove oil and citric acid can be very good too! It is so important that we let our neighbors know how damaging commercial weed killers can be to the environment. We also need to consider that some plants that we consider to be weeds

are an essential part of the native ecosystem, no monarch butterflies without the milkweed."

A tall slender boy named Greg from the blue team came over and said loudly "What difference does it make if you kill a bug? Butterfly or spider or ants, they all need to be kept out of my space. Bugs are not important to humans!"

Cole answered back, "The insects and arachnids that you mentioned are all important to the planet. They are food for other organisms. Ants breakdown woody materials and help with decomposing. Spiders, which are arachnids not insects, eat pests like flies and mosquitoes."

Greg laughed, "OK Mr. Bug Lover. Sorry if I wound you up."

Hugo's teammate Grace agreed with Cole. "There are so many beneficial insects Greg! They even keep some insect pests under control. We use ladybugs to keep the aphids off our roses."

Mr. Mayor made his way over from the yellow team to chat with the other teams. "It is always very exciting to begin a new session. The challenges are all lined up with an insect theme this year. I hear you have an entomologist on the green team. That should give your team a boost!"

Cole wondered how a challenge could be about insects since they were so small. Of course knowledge could help when expanded to human size. "I hope that I can really help my team!"

Chapter 6: Camp Adventure Challenges

The first four days went by quickly as the teams enjoyed physical and mental challenges. The Green team learned to work together as they each shared their strong points with the group. Whether balancing on beams across a river or doing timed puzzles it was fun to compete. Peabo knew the best technique for the physical challenges. He and Cole worked cooperatively on the puzzles with help from their team. The Red and Green teams started to hang out together during break times.

"Luella did you bring anything for sore muscles?" Michael was not used to doing such strenuous exercise. Luckily Luella had an ointment to rub on that cooled and soothed the pain.

Day five, the Green team was competing in their first major challenge. The teams are led to an area surrounded by a green fence six feet tall. Inside are numerous 3 foot on a side (or diameter for the circle) tubes made of plastic that are circular, triangular, pentagonal, and/or hexagonal. Each are six feet long and all but two must be set up and supported at least one foot off the ground using rope connectors. A sign states "The winning team will design the structure rapidly and efficiently so that the volume filled by the structure is maximized using the minimum amount of materials and taking up only a 6 by 6 foot area footprint touching the ground. When complete the team must assemble any and all supplies needed from the local natural area within your color fence to stay in the structure until 6 am tomorrow morning. Pockets will be emptied and only the clothing on your back, a flashlight, water bottle, and your Swiss Army knife will be allowed (no snacks from your pockets unless they came from the forest).

Peabo deconstructed the design problem for construction using geometry. The hexagon would maximize the interior space while fitting together efficiently. Four hexes needed to be stacked by lashing them together with ropes. Peabo and Cole got busy with the task.

Meanwhile, Michael and Luella looked for food and cover materials in the forest. "Do you guys want to eat bugs? Or would you rather be a little hungry until morning?" Luella personally thought she would rather be a bit hungry, even though she knew crickets were good protein. They would not starve to go from their 2 pm snack until morning. She would find some berries if she could. "No bugs Lu!" Shouted Peabo and Cole together.

When the shelters were ready they each climbed in their hex tube and settled in for the night. It was warm at night, so no one needed covers. They could only leave to use the toilets. Luella wanted something for a pillow so she rolled up her sweatshirt. The boys all decided that was a good idea.

"Well, now what do we do?" Michael said. " I am not ready to sleep yet! Usually Mom and I chat for a while before I go to sleep."

"It is very weird trying to get comfortable in this tube. I wonder if I will sleep at all."

Luella made a fake yawning noise, then laughed.

"When my family went camping we sang movie tunes then guessed the movie or played word games after the sun went down." Cole started to sing "Somewhere Over the Rainbow".

"Wizard of Oz" said Peabo. The group played several rounds of the movie tune game with Cole winning by three points.

"Let's try being quiet and get some rest". After half an hour they had all drifted off to a light sleep. Around midnight something was thrown over from the direction of the Blue team. Suddenly the air smelled terrible. "Ugh! A stink bomb. Quick fan the air away from us." Michael gagged. Peabo added "We have got to do something to the blue team to get them to stop the practical jokes!" They managed to clear the scent away and stay in their tubes, but it was hard to get back to sleep.

After completing the challenge, the green team woke up hungry...especially Peabo. They very happily took huge portions of fruit, buckwheat pancakes, sausages and milk. When the scores were revealed, Luella congratulated Hugo from the red team on the close first place since the green team only lost by 1 minute. Blue team was at 5 minutes. The yellow team fared the worst because their circular structure fell apart at 2 am and dumped them all on the ground.

Jealousy welled up in Peabo, who was feeling hurt that Luella seemed to like this other boy Hugo quite a bit. When he saw them laughing together, he made a comment before he took time to think it through. "Don't give away all of our secrets Luella, he is on the enemy team." Luella looked surprised, then puzzled, she responded "Just because we are competing does not make us ENEMIES. I would never do anything to jeopardize our team Peabo as I think you know. Was that some kind of bad joke?" Peabo quickly responded, "Yep, sorry...um..I guess hunger messes with my brain." Luella smiled back at Peabo, "We will just call it low blood sugar then".

Luella went to talk to Peabo alone as soon as she had the opportunity. "I know that we are best friends Peabo, but that does not mean that you are my only friend. I like finding out about people and making social connections. That is really not your thing. You need to understand that I am going to make new friends all of the time, while you are more introverted and will take more time to accept new people. I notice you still are not 100% sure of Cole." Peabo replied, "I am sorry Luella. I do get impatient to have your full attention because you are my BFF. In the future I will try to remember that you need to interact with many people. I know in my heart you would never betray the team!"

When Cole and Michael joined them, Luella told the green team that she thought that the red team had many strengths. "They will be our stiffest competition. The blue team likes to goof off too much and doesn't take the challenges seriously. They put salt in the yellow teams sugar bowl at breakfast."

"I agree Lu" replied Michael, "the red team is very clever. Grace and I discussed the science of soda pop at lunch. She knew quite a bit about gas solubility in a liquid."

"I enjoy the challenges." Said Cole. "They all relate to our combined interests so far. It is fun figuring out how to carry them out."

"I wonder what we will do next?" Michael asked. "I hope that I get to use my chemistry."

Chapter 7: The Ant Trap

Day 6 had begun with a good breakfast and an explanation of the next challenge. "This afternoon your team will get to experience what it must be like to be an ant," said

Mr. Mayor. " you will be given a load to carry to the colony queen at the center of an underground tunnel maze. The first team to reach the queen through the four identical mazes will triumph! There is one special challenge, you will be totally in the dark. No flashlights or anything that lights up will be allowed and no talking, you must think of the most efficient way to explore and communicate with only touch and scent and non-verbal sounds like tapping on a rock with a spoon. Each team member can have two items from the kitchen. Be sure to leave all devices in your cabin because if any light is detected by our sensors, your team will forfeit. You may have the rest of the morning to form a plan and will enter the "ant trap" after lunch at 1 pm.

Michael immediately started to talk about his ideas about smelly chemicals, even though the others teams were still able to hear. "Michael, please stop talking about ideas until we get to our area!" Cole requested. Peabo was less diplomatic and said "You are such a chatterbox Michael. Can't you keep anything a secret?" Michael replied, " I was just talking. I have a dozen better ideas than the ones they heard. Nobody is going to steal your dirty socks to get an edge in the competition."

Luella sighed and thought to herself "Now I will have to play peacemaker again and the three of them will be so busy talking that they forget to listen." Cole saved her from her worry by coming up with a teamwork plan. "Look, we all have good ideas and it is important that everyone is heard. Why don't we take turns giving five minutes to allow each person a chance to explain what they would do. Then we can vote and have time to prepare. Let's begin with Luella, she has not had a chance to talk."

Luella had good ideas of how to use kitchen tools and food for scent trails. "We will want to use strong odors and have a different scent for each person. The tool to work with the food item can also be used to signal by tapping on the rock walls. For example, a metal garlic press can be used to spread the odor of garlic and make a metallic clang against the cave walls. Cloves or cinnamon can be ground in the mortar and pestle to release their fragrance and the mortar should make a very different sound on rock."

Peabo spoke next, "We can tap two taps pause ten seconds, repeat when we find the queens lair and then backtrack the scent trail back toward wherever we must separate. When a tapping signal is heard the receiver can tap one-two-three during the ten second pause. Also I can bring my minty breath spray that my dad the dentist always provides for me and a spoon to tap the walls."

Michael added, "We can use lemons or oranges with a grater for another different scent. Citrus peel is very fragrant. We can each take different paths when we come upon branches. Lu can go down the first branch, then Peabo. Whenever we get to the third branch Cole or I can hold the place and listen for the sound signals and scent. Then he can mark the correct path with a strong scent trail and tap."

Cole recommended that if they encountered each other in the dark they should rotate the person by holding a hand and then pointing the hands in the correct direction or point down if you don't know the correct way to go.

In the end the team picked scents of clove for Michael, garlic for Cole, lemon for Luella, and mint breath spray for Peabo. They agreed that wherever the tunnel split one person would follow it and release scent as they backed up the trail to the queen's

chamber. Cole would stay at the split and cut open his garlic cloves when he received a message because he was found to have the most sensitive sense of smell in the group.

"I get stuck with garlic breath." Laughed Cole.

"I read an article in Science News that ant's antennae both send and receive chemical signals. They can tell other ants what group they belong to." Cole explained.

"I saw a Ted Ed on You Tube by Deborah G. Gordon about ants." Said Michael. We each need to have a unique scent we can spread when we find the right path and use it as a signal to follow down the correct path. Ants use different chemicals to mark the path for food. Bees have chemical communications too!"

The challenge began with them all clustered together with hands connected together. When they entered the cave the entrance was wide but soon it narrowed down to one person width so they had to go single file. It was pitch black in the cave and cool and still. The cave smelled slightly of damp earth. At the first split in the tunnel Peabo went right while the rest went left. Less than ten feet further was another split, Luella took the right, Michael followed the left and Cole waited at the junction.

Time passed slowly as Cole waited patiently in the cool dark cave, trying to catch the scent or sound of one of his teammates. The dark and quiet made him feel uneasy as it reminded him of those nights after his father died, when the only sound was quiet sobs from his mother in the next room. This experience was triggering his grief and worry about taking care of his mother. He hoped that she was doing well without him. Cole was too ashamed of being weak to share his feelings with his team.

Then Cole smelled the spicy cloves scent and heard the tapping signal coming from the left hand tunnel and knew that Michael had the right path. He tapped out his one-two-three and waited for the response. He would strengthen Michael's signal with his own scent. He placed some of his garlic at the juncture of the paths to signal to Peabo and Luella when they returned. Then he tapped the one two pause code. It was great to have a cousin and friends! Being busy helped keep his mind off sad thoughts.

Meanwhile, Luella let out a squeak when her outstretched hands bumped into Peabo instead of rock. Peabo sprayed some mint her way to identify himself. Their tunnels must have been connected in a loop. Luella returned some lemon scent, then signaled Peabo to turn and they move back to the tunnel juncture as quickly as they could in the dark. Soon the scent of garlic and tapping code lead the way.

When they arrived to the lighted queen ant chamber they all high fived and jumped up and down. Everyone was afraid to talk until Mr. Mayor entered and congratulated them for winning the challenge. "Great job! Now go enjoy some lunch before an afternoon of solving math puzzles."

At lunch everyone chatted excitedly about the morning while gulping down the yummy lasagna with cheese oozing out of it.

"I think having a chemical language is awesome!" Exclaimed Michael. "Just imagine at school we had signals...like orange scent sprayed meant meet me at the door at the end of class and mint meant I brought a great dessert to share today."

“Just so we don’t start sending out garlic smell! Nobody else will want to be around us!” Said Cole.

“There are many ways to communicate that don’t involve talking. Maybe we should come up with a few hand signals or body moves during the rest of lunch in case one of the future challenges involves vision without use of sound.” Suggested Luella.

“Great idea Lu! Also some finger tapping versions would be cool, like if I am beside you and I tap once followed by three quick taps means stop moving now.” Added Peabo.

After lunch it was time for math puzzles. They got to practice the type for 2 hours, before competing to solve the puzzles fastest. The puzzle begins with a target number being given. Then numbers from the choices given must be placed on the lines that are connected by math operations. Each digit is only used once and you will not use all five digits. When the math operations are completed in the order given the answer needs to be the target.

EXAMPLE: target = 27. numbers to use 1,2,7,8,9

___ divided by ___ then multiply the answer by ___ then minus ___

Which digit goes in each position? There is more than one correct answer.

“We need to think of a system rather than trying each possibility, which has over 100 possibilities.” Said Peabo. “That would not be fast.”

“What about factoring? Asked Luella.

“That would work if it only had multiplying and dividing, but there is subtraction.”

Answered Cole. “When I work puzzles like this I start from the end and find the limits. Start with the nine, the highest number should have the biggest effect on the size of the answer. If the last digit was 9 then the answer would be 36 for the multiplication step before. If the last digit is 1 then 28 is the answer for the multiplication step. Possible products in the range are: $4 \times 7 = 28$, $5 \times 7 = 35$, $6 \times 6 = 36$. There aren't any 6's so we are looking for a division that gives 4 or 5. $8/2 = 4$, then $4 \times 7 = 28$, then minus 1 equals 27. The digits are 8,2,7,1!

Chapter 8: Building a Web

For the final physical challenge the teams had to work with another team to use ropes as a bridge to allow them to travel a gap between two poles. The Green team was paired up with the Red team, so Hugo was going to be working with them. Each team would have to build toward the other without stepping on the ground between. Only sign language or "playing charades" was allowed for communication. The team that built the strongest connection with the best cooperation would win. The teams must be able to quickly move from side to side.

Peabo began by building a rope ladder attached to each of the curved metal pieces that extended out every two feet. They had to get the free end of the rope across the gap without walking the ten feet. Cole and Michael found weights to tie to the ends of the ladder rope pieces while Luella worked on knotting together some pieces into web like designs.

"Can you throw this to the other team?", signed Cole by showing pointing to Luella and acting out throwing the weight on the end of the rope.

Luella shook her head no and pointed to Peabo. Luella pointed to Hugo until she got his attention to catch it and attach it tight across the gap. Michael waved his arms at Hugo and mimed the required action. Once the first rope was attached, they could use it to connect new ropes across the divide. Sally and Grace from the red team were on their schools gymnastics team. They had an easy time crossing the single rope with ends of new connecting ropes tied around their waists.

Soon they had a nice "web" to travel across like spiders. Everyone took turns traveling from side to side. Michael almost slipped when one section of rope tugged loose. He thought to himself, "We have to tie this one up better. Do we have any rope pieces left?" They had used all of the rope, so they had to avoid the bad spot. Unfortunately before Michael could communicate it Hugo was hanging upside down by only one leg. The blood rushing to his head was very uncomfortable and he could not reach any rope with his hands. Luella was quick to move in to assist Hugo in getting upright again.

Michael and the rest of the group all started to laugh. Hugo was turning bright red. He found his clumsiness embarrassing. Hugo was very grateful to Luella for rescuing him and not joining the rest in finding it a funny joke.

It was not a difficult challenge. The green and red team easily beat the yellow and blue. Peabo's strong arm helped "The other teams had to design a tool to help connect their webs, instead of throwing."

When they were allowed to speak Michael said "It is a good thing that Luella is not a spider or Hugo would soon be her lunch!"

Grateful Hugo said "Thanks for the assist Luella. That was awkward. I owe you one."
Luella answered "No problem, I am sure you would do the same for me."

Chapter 9: Mind Games

The last step was a game show type competition on math, science, and nature. The red and green teams were close enough in score that this would decide the victory. The other two teams could only win if the top teams did not get many answers correct while they got them all right.

The game had each team sitting at their table with paper for each round. When a question is read the team members pass around the paper without talking and put down the answer. If more than one answer is written the team votes which answer to keep and draws a line through the unwanted answer.

Mr. Mayor called out the first question using a microphone. "Which of the following is NOT an insect --- cricket, tick, butterfly, beetle, mosquito? You have 2 minutes.

Cole wrote on the paper " ticks are arachnids not insects!" The rest of the team put smiley faces for approval of the answer. They were happy to have a bug expert on their team.

Score after round one: green 1, red 1, yellow 1, blue 0

"To prepare a fruity smelling ester in chemistry which of the following would you mix in the dehydration reaction --- carboxylic acid, alcohol, amine, amide, ether."

Michael started to laugh. His Father had taught him this reaction to make banana scent one evening when they were talking about camp. He wrote carboxylic acid and alcohol on the paper and smiled at his group. They did not know the answer but trusted that Michael did, he was the chemistry guy.

Score after round 2: green 2, red 1, yellow 1, blue 0

"That was a more difficult question. Now for a bit of physics. If a force of 100 N is placed so that the force is distributed on the following different size objects, which would apply the most pressure on the ground? Postage stamp, snow shoe, children's wading pool, tip of a knitting needle."

Peabo took the paper this time and wrote $\text{pressure} = \text{force}/\text{area}$, the smallest area is the tip of the knitting needle. Decreasing the area makes the pressure value larger.

Score after round 3: green 3, red 2, yellow 1, blue 1

"Geology is interesting. Calcite is a calcium ion containing mineral, what is the negative ion--- nitrate, phosphate, carbonate, or sulfate."

Nobody on the green team knew the answer to this one so they guessed phosphate.

Green team was wrong the answer was carbonate.

Score after round 4: green 3, red 3, yellow 2, blue 2

"A plant used in pesto sauce, it has antibacterial properties and reduces inflammation."

Luella took the paper and wrote basil on it confidently.

Score after round 5: green 4, red 4, yellow 3, blue 2

"It looks like we need a tie breaker. First one with the correct answer for green or red team wins. Fahrenheit temperature conversion to Celsius is the formula $C = 5/9 (F - 32)$. What is 50 degrees Fahrenheit in Celsius?"

Cole quickly calculated. Fifty minus 32 is 18. 18 divided by nine is 2. 2 times five is ten. He took his answer to Mr. Mayor first...10 degrees Celsius!

The green team had narrowly beat the red team and won the games!

Chapter 10: Surprise for the Winners

Mr. Mayor announced to the team at their victory dinner in his private dining room, "For the winning team, I offer a special challenge, one that I will have to ask you to keep a secret, whether you choose to take it on or not. I am the keeper of this portal to a quantum linked parallel world like ours except the knowledge and technology is different. There are six portals on the earth with a portal keeper on each side to guard it. We have spent time in both worlds and try to keep the negative influences from each from seeping into the other."

"Since nobody in either world truly understands the quantum nature of matter and the nature of Dark Matter and Dark Energy, there has been very little interaction between the worlds over the years. The scale is so different and that complicates matters greatly. Their world has developed technology that uses Dark Energy to counteract attraction forces within the atom for a limited time. This is the basis of human tales of ghosts. Travelers to our world have their atoms stretched so thin that they appear

transparent, they can not easily move objects of this world, and can pass through gaps in matter."

"Excuse me, Mr. Mayor, you are saying that ghosts are people from another world. Wouldn't scientists be able to detect the atoms, even spread so far apart?" Asked Michael.

"EMF detectors have been used to detect very low intensity electromagnetic radiation signatures now that people have tried to use science to detect ghosts. Of course, not all ghosts sitings are real. Most are just people imagining they see something. Those of us who guard the portals have tried to see to it that there are not many travelers between worlds."

"But ghosts are supposed to be magic!", exclaimed Luella.

"To quote Author Arthur C. Clarke" Mr. Mayor said "any sufficiently advanced technology is indistinguishable from magic. The technology of the other world has advanced in areas of quanta, the world of the very small at the atomic level and biotechnology. They have very crude technology in the area we would call Newtonian physics and so no devices like automobiles or even bicycles."

"So how do they travel around?" Asked Peabo.

"They have advanced in genetic manipulation and size variation, so they ride various creatures, some of the creatures can fly quite rapidly. Even our common dragonfly can travel at 56 miles per hour. Imagine flying on the dragonfly with a saddle."

Biotechnology has been used in different ways in the alternate world. Venemon and his scorpoids were human arachnid hybrids with a human head and arms on a scorpion torso. This made them intelligent and strong. They tended to be less social and cooperative than most humans."

"We need to send your team through the portal on a mission. Even though we don't understand how dark energy works, a scientist from the other side of the portal has developed the technology we need to carry out this mission."

"Excuse me Mr. Mayor" said Luella. "Why are you talking to us about this? Shouldn't a team of adults be sent on your mission instead of a bunch of teens?"

"Smaller body size and more flexible brain are required. The device (protonic) that is used compresses the body size proportionally by using dark energy to increase the nuclear charge causing the electrons to move closer to the nucleus. There are limitations and Peebo only has six inches in height to reach the safe limit for the device. the device can shrink the group down by a factor of two hundred safely for up to one week, beyond that it becomes impossible to stretch the individual back to normal size."

"The physiological and hormonal differences between teens and adults make this temporary transformation possible. My small stature is from carrying out the transformation when I was in my twenties. I can not be stretched any further without tissue damage. Teens have thinner skin and more rapidly dividing cells. The adolescent brain (11 or 12 to the mid 20's) is winnowing the synaptic connections that are not reinforced particularly in the prefrontal cortex where planning, reasoning, and impulse control take place. Brain fluidity is needed for this project."

Spending time with the bees and ants means you will need to use their chemical communication to lead them to where they are needed. Bees communicate using chemicals like those found in Nasomov's secretion. The chemical Isoamyl acetate causes alarm when the hive is under attack. Bees identify invaders from other hives by scent, so you will be covered with the hives scent before we send you in. The Queen bee will be mentally linked to Luella so they can communicate by thinking in images.

Chapter 11: Meeting with Meso

" Fortress is the Arachnid outpost where the evil Scorpioid runs his empire." Mr. Mayor began. "The ultra intelligent part scorpion part humanoid leads the SCORPIOID army in their quest to rule and enslave the Insects. Like scorpions, the scorpioids live solitary lives in individual fortresses. They only get together to plan. This empire exists in a universe parallel to our own with a slightly lower gravitational field. Let me introduce you to Venemon's lead scientist, Meso, a SCORPIOID who has defected to our side. He discovered a way to quantum link the universes by tunneling using massive quantities of Dark Energy. The Q-link device took ten years to build and uses very rare materials so Venemon has the only one currently. Meso wants to make the Q-link inoperable."

Meso cringed at Michael who was munching on some cinnamon graham crackers. "Scorpiods are repelled by cinnamon. Could you please put those away in a plastic bag?" Michael quickly tucked away his snack.

Meso spoke "Venemon found that the health of Insects on his world is somehow linked to their health on Earth. He has used his device to send Varroa mites to attack the bees of Earth, which had been weakened by the use of neonicotinoid pesticides. Each bee colony that collapses on Earth weakens the Bee Collective on Venemon's world."

Insects are fighting the arachnids because the Varroa mites are taking over the bee hives by acting as parasites that consume the hemolymph fluids out of bees bodies. Varroa mites will not be a direct hazards to our humanoid team because they are not anatomically similar to bees and are wearing the protective armor.

Meso frowned, "I despise how my work is being used. I got to your Earth by sneaking in with one batch of mites. I have been working with a team at The University to build some transportation devices and robotic armor to allow the Earth people to fight back. It would take too long to develop as powerful device as Venemon has, but I have found that some individuals from the two worlds have a quantum bond which allows a small group to travel by holding on to the individual using the bond locator quantum link device (BLQL). The BLQL can only be used by young humans because their brains are still resilient enough. Adult humans would suffer damage to their neural network. Also there is a compression effect caused by increased atomic attraction forces that causes

the individual to become smaller and more dense. Young individuals respond better to this change in body density."

"Compression takes place next with pulses of dark energy, each giving a 90% size decrease. Mass remains the same so density increase takes place. The team are decreased to about one tenth their original size, so a five foot height is reduced to 6 inches. The next step is to be fitted with technology suits that will allow for bee like flight for those who are light enough in weight or slow up and down for heavier individuals."

"The biggest hazard faced is Venemon's Scorpioid Army. They have built a pyramid shaped fortress for Venemon in a forested area home to many arachnid predators (40,000 species of spiders, scorpions, and ticks). The Scorpioids occupy the bottom floor of the building and guard all of the interior routes to Venemon's rooms. There are four balconies on his level that could allow you to get to him from the air, but they often have a guard on watch.

"I can make a spray that is a scorpion repellent with lavender oil, cinnamon oil, peppermint oil, and cedar oil. We can each carry some in water pistols to use against the Scorpioids." Said Luella.

Then there are the many spider species may be encountered on your path to Venemon's Tower Fortress. In your compressed size, these spiders will all be about the size of a small dog relative to you, except the SCORPIOID and the Tarantulas which are about your size but do not stand upright."

"Arachnids have venom, but most species venom is not toxic to humans. Insect Allies will have to withdraw to protect themselves from spiders and scorpions. The spiders are all predatory carnivores that use silk to trap and hold prey as well as for creating living spaces and wrapping eggs in cases."

Cole's knowledge of insects and arachnids gave him insight into how dangerous spider predators could be. Diluted bleach solution or citrus oils can be used to dissolve the webs. They would need to be prepared to escape being trapped by spiders that would be close to the size of dogs compared to them. Cole was worrying about his Mother. If something happened to him on this mission she would be devastated. But when Cole had worried about going to camp his Mother had told him that even though they would always worry about each other they had to stay brave about trying new things if the new things were worthwhile. Was saving the bees worthwhile? Yes!

Chapter 12: Getting Ready to Meet the Queen Bee

First the team had to prepare backpacks with supplies from the kitchen. Squirt guns filled with diluted bleach to dissolve spider web. Cinnamon powder in envelopes to open and throw at Scorpions. Just working on attractants and repellents to help distract the bugs while the mission was completed.

"Bees are insects with three body parts --- head, thorax, and abdomen. They have six legs and a pair of antennae." Said Cole. " Bees communicate using chemicals and with a special dance that can communicate which way to fly and for how long to get to food."

Meso determined that Luella has a quantum bond to the Queen bee of the Hive Fortress of the Bees. This is an important bond because the Queen is always in the Hive and exerts control over all of her subjects. The quantum bond will allow Luella to communicate mentally with the Queen and quantum teleport to her location. When you arrive you must come up with a plan to change out the power source for the Q link device. This is not a mission to take out Venemon, but only to remove his power to harm the bees. When the mission is completed you are to gather the group and return here or to the Queen bee.

The team arrived at the Hive Fortress of the Bees, using the BLQL which allows for quantum teleportation between objects with quantum entanglement.

"Duck your head guys there isn't much room here for us." Said Peabo. "It is filled with golden light," Luella exclaimed. Cole explained "the thrumming sound is bees flapping their wings to evaporate water off the nectar to form honey." The hive has the sweet scent of bees wax and flowers. "Look it is raining outside, luckily bee's wax is NONPOLAR so it repels the water" Michael commented.

Luella stands before the Queen Bee. Because of the compression, the Bees are the size of a large dog in comparison to the humans. The teams movements are sluggish, like they were wearing a full pack and heavy armor. They wear a robo-bee suit so that they can function as a drone bee. The suit gives the ability to fly using the air vortex motions of bees wings if you are not too heavy. Peabo is too heavy to do more than a hop like motion!

The hive is vibrating with the activity of bees. The new arrivals are doing the honey waggle dance which shows the location of the rich sources of nectar in the fields surrounding the hive. They move in circles jiggling their bodies when they are traveling at the correct angle from the sun to get to the flowers.

The BLQL device is used to take the group to the Queen. Luella has to think about what the group wants to do and the Queen responds. Communication is more in pictures than in words. Luella begins by bowing to the Queen to show respect. "Hey Guys, bow with me to the Queen." Luella visualizes Peabo unable to fly to the Queen. The Queen responds with a picture of Peabo marching with ants.

" The Queen indicates that Peabo should travel with the ant army. They are working with the bees to help them survive. They will act as a distraction while the bees show us where the fortress is located."

Peabo exclaimed, " I don't want to be alone with a bunch of ants. How will I communicate?"

Luella answered,"Remember the ant trap challenge! We will need to use scents and sounds and charade type motions to get the message across. I think that I should travel with you on the ground with the ants while Cole and Michael do the aerial travel with the bees."

Luella visualized taking the part out of Venemon's machine and breaking it. The Queen visualized entering the top floor of the fortress through the windows. The fortress is a black stone pyramid with terraces off the upper levels. The Queen gives directions to the fortress by showing Luella the dance she must do for the worker bees. Then she was taking honey and placing on the path to lead the ants along to the ground floor level of the tower. She showed many spiders along the way, trying to capture and eat the insects.

"The Queen will give us some honey to lead the ants around. They will follow a trail for food. A swarm of ants at the fortress entrance should be a good distraction. The hard part will be getting past the spiders. I know something to help ward off these arachnids. Citrus, peppermint, and lavender oil are repellant to spiders."

"Luckily we brought our scent communication kit with us. Everyone put on some orange oil and spray with the peppermint breath spray. Just don't use the banana oil! That is the bee alarm pheromone and we do not want it released in the hive."

They all bowed to the queen as they got ready to leave the hive. The journey would now require that they lead the ants and bees that are to act as distractions while they used their two assets --- hands and brains. The ants and bees could not complete this mission and replace the power source. They needed humans.

Would they be able to get safely by the spiders? The green team had to try. They could always huddle together and use the BLQL to go back if they had to. Cole really wanted to help the bugs, especially the bees. Only the scorpoids worried Cole since they did not have any knowledge of what they could do.

Chapter 13: Life Among the Spiders

"The spiders are not really our enemies, they are predators and Venemon uses them as a barrier to attack on the fortress." Cole explains. "Arachnids all have 8 legs and two body segments. Not all spiders act the same. Wolf spiders work alone, they are large, not web builders. These hunters chase and pounce upon their prey! We will have to watch out for these from our position in the air to protect the ant army with Peabo and Luella."

The Forrest was dark and gloomy, which made it more difficult to spot the webs hanging from many branches. There was an odor of damp leaves on the forest floor. The trees grew close together in crooked shapes. Michael thought this would make a great video game --- flying while avoiding the webs and spiders.

Michael called out to Cole " In the air we have to watch out for the webs. Spider web is very strong. I read that a given weight of spider silk is five times stronger than the same weight of steel. If we get wrapped up it will be hard to get out. Madagascar's Darwin's Bark Spider's web is ten times stronger than Kevlar used in bullet proof vests!"

Peabo and Luella began their march along the ground leading the ant army. It was difficult without any clear path. They struggled over downed trees and branches. Everything seemed fine then the GROUND Spiders were encountered. They started shooting sticky silk to immobilize the ants. Many of the ants in the first row were

covered up. They would have to be released or face having their body fluids sucked out. Michael shouted "The spider silk can be dissolved by the vinegar and coconut oil mixture in the spray bottles. Just be careful not to get it in your eyes."

While Peabo was focused on freeing two of the ants, he suddenly found his arms wrapped up tightly against his body. A strand of web kept him from running away. "Luella! I am stuck!" He pulled with his weight against the strand until it snapped. The motion on the strand of web attracted the spiders attention to its prey.

Luella sprayed the spider in the eyes with the peppermint oil and lemon oil spider spray they had packaged in old window cleaner bottles. "Run to the path on the left!" She yelled at Peabo. When the spider was distracted by a group of ants, they stopped and Luella removed the web with some vinegar and her scissors.

"Thanks! That was a close call. Spider webs are no laughing matter here." exclaimed Peabo.

As the remaining ants that were not caught in the web left the area behind Peabo and Luella, the spiders retreated and the group was ready to proceed. The next spider they encountered was a wolf spider. Michael and Cole shouted out when they saw it coming out of the forest. These lone hunters are fierce predators. One of the ants was killed and devoured before they could fight it off. Peabo had a short sword that he used to hold back the spider. Eating the prey seemed to satisfy the wolf spider and the rest of the army moved quickly out of its territory. Peabo and Luella kept looking back to make sure they were not followed. Peabo found a large branch for Luella to use as a club in case there was another encounter.

The forest was scary with so many spiders about, but the arachnids were not organized here. They just did what they naturally do, prey on insects for food. The ant army was the same. The ants just marched along following a scent trail set down by Luella and some milk from aphids that they had brought along. They could be distracted by food sources in the forest. It was a challenge to lay down enough scent to move them along.

Meanwhile in the air above the bees with Cole and Michael had to avoid running into webs. The bees were essential because they knew the way to the fortress through the Queen bees dance instructions. It was difficult to keep track of the group of busy

buzzing bees! "It is like trying to herd a bunch of hyperactive children in for nap time." A few bees got caught on the edge of a web and had to be released.

Chapter 14: Entering Venemon's Fortress

The black stone fortress shaped like a Mayan pyramid loomed large ahead. Each ledge was 10 feet of smooth stone leading up to a flat area. There were ten Tiers in all with four balconies surrounding the top level where two Scorpiods with the body of a scorpion and humanoid head with a pair of arms with hands were on guard. More Scorpiods guarded the front door on the ground level. These guards were soon overwhelmed by the large swarm of ants as Luella and Peabo lobbed packets of food at the guards.

The ant army entered the lower floor of Venemon's Fortress with Peabo and Luella at the center. The Scorpiods fought the ants on the perimeter while Peabo and Luella headed toward the stairs. "Let's try to sneak around the guards Peabo!" They hoped that they could hide behind a group of ants and get behind the SCORPIOID guards. An element of surprise could come in handy.

Unfortunately the stairway seemed filled with Scorpioid guards. Three ants got in the stairwell ahead of Peabo and Luella and they pushed up among them. Peabo noticed a trap door in the ceiling and getting a boost from the ants they got up and through the hatch. The stairwell would now appear to just have the ants in it. Up top the humans got their ropes ready to grapple up what appeared to be a ventilation shaft to the top of the pyramid. The sides of the shaft were like a climbing wall with ledges to the top floor. Good thing that they had lots of practice from the fitness trail!

Meanwhile, the bees swarmed around the balconies at the top of the pyramid fighting with the SCORPIOID guards. While Peabo and Luella worked their way up through the fortress, Cole and Michael flew onto a balcony sneaking behind the guards who were occupied with the bees. Cole quickly snuck into the open window and got behind a pillar of stone, but Michael was seen by Venemon. "So the party downstairs is just a distraction young man. You have been sent to my lair by the window, but I have learned to watch for the queen bee's warriors. They will not land here because I have pet varroa mites. If they take the mites back to the colony it will be doomed." The bees had not landed and were swarming many feet away from the fortress.

Cole held his breath and tried to remain undetected while Michael seized the moment to draw the attention of Venemon with his favorite topic. "I have come here bringing magic from my world and seeking the mysteries of yours. I know the wonders of

alchemy and can change matter before your eyes." Michael moved away from Cole as he said this and got a few vials out of his pockets. Cole could tell he was being given the chance to sneak over to make the exchange in the V energy source from the Q link device. Now Cole the thief would test his abilities!

Venemon's focus was on Michael as he moved across the room toward the front panel on the left side of the large Q device which took up most of the room like some archaic computer system. Michael knew that Cole would be going for the power source on the back right. Now was the time to chatter to draw Venemon's attention. "I can be a great resource to you, with chemistry I can make neonicotinoids to weaken your bees here. I have snuck in here alone to offer my help while my colleagues battle below." Michael hoped that he would be a good enough distraction.

Peabo and Luella snuck in through the trap door from the shaft and then covered the hatch with a heavy chest they pushed from nearby. Two guards were standing outside a heavy door to the stairway. Luella shot the guards with her scorpion repellent spray. They then closed and locked the door leading to the stairway so no guards could enter. They heard Michael's voice talking to Venemon about insecticide production in great detail. Michael was in extreme chat mode. What was going on?

Chapter 15: Replacing the V Power Core

One thing blocked Cole's progress! A gate with a lock device with rotating numbers 1 through 9 on four columns connected $(__/__) \times __ - __ = \text{target}$. Target was written on a big red button. Cole pushed the button and the screen above the button displayed "target = 11" digits used 3,6,7,9 time to set lock 3:00 minutes. A clock started ticking down. Cole quickly went through the possible answers to the multiplication. Twenty was not possible, because there was no 4 or 5 ($4 \times 5 = 20$). Eighteen works as $3 \times 6 = 18$, so the last digit could be the 7. The three can be obtained by $9/3 = 3$. So the sequence 9,3,6,7 would work. Cole rotated the dials to select the digits with eight seconds to spare.

Behind the Q device, Cole carefully unclamped the power device and replaced it with the defective one Meso had produced. This would breakdown within a few days or if the device was used and damage the core. Cole stuck the screwdriver tip into the good power device where Meso had instructed him to during the orientation. Now it would not work even if it got left behind or discovered. He tucked it in his pocket. It was time to get together with the BLQL and go back home before Michael ran out of chemistry lecture or Venemon ran out of patience.

Luella and Peebo had blocked the entrances into the upper level. Venemon would not be getting any help from the Scorpions below. The ants would be wandering away as the food suppliers were gone now. The bees had already started to disperse without anymore signals from the group. Hopefully the need for distraction was almost over.

Cole noticed that Luella and Peabo were in the room near the exit shaft, so he stealthily moved over to them. The three of them moved over to Michael and all together held out the BLQL. They shot the last water pistol filled with scorpion repellent in Venemon's face. Michael quickly grabbed the device and pushed the button before Venemon could recover and grab them. They were going home, but on the way they felt a large jerk on the device. Something had gone wrong!

Chapter 16: Hugo to the Rescue

When they got back to Mr. Mayor's house Luella was missing. She had lost contact with the BLQL. "I know she was linked in when we left Venemon's Fortress. We have to go back and find her now!" Shouted Peabo. Mr. Mayor replied calmly, "None of your group can return now without damage to your body and mind. We are using the scope and I think we are lucky because she is quantum linked to the Queen Bee. It appears she is in the hive, not in Venemon's hands."

"We still can not leave her in the hive. How can we get her the BLQL so she can return home?", asked Cole

Mr. Mayor suggested, "How about Hugo? He would be able to travel to the hive. We can call him in and ask if he is willing to do it."

The group waited rather impatiently for Hugo to be called in from the games. Michael as usual could not help but speak out. "Hugo! We need you to rescue Luella and bring her back from an alternate universe by taking the BLQL to her!" Hugo looked very stunned. "Is that where you have been? We thought that you just had special games or a field trip."

"Will you go now and get her? Please!" Asked Peabo. "I would go if I could use the device more than once. Meso will show you how to use the BLQL device to go to Luella and then you can bring her right back." Hugo replied "OK, just so I don't have to use a map. I always end up turning right when I need to go left."

Hugo arrived at the bee hive and found that Luella was summoned to the hive because the Queen bee was dying. The Queen had been attacked by a Scorpion and now it was crucial that Hugo and Luella help establish a new Queen. Worker honey

bees had identified several larvae that had potential to become Queen. Luella and Hugo helped to feed royal jelly to one of these larvae to form a new Queen. Their help was needed because some of the worker's had not yet returned from Venemon's Fortress.

Back at Mr. Mayor's house after two hours they were all getting very anxious. "What could be taking so long! We should not have sent Hugo, he probably got lost!" Peabo worried. "They will return soon I am sure" said Mr. Mayor. Suddenly Luella and Hugo appeared through the portal, each holding on to the device.

"We helped save the hive by preparing for a new queen. While the bees helped us distract Venemon's army the hive was left vulnerable to attack of the Queen by a SCORPIOID. The hive was really buzzing when we left, the bees had just returned from the fortress and the intruder was killed. We helped keep the bees from suffering any damage from our visit by preparing a new Queen." Luella exclaimed.

Soon after the portal presented Venemon. He was stretched so thin he passed through some less dense objects. He had followed using his device before the battery failed. It would not work to return him to his world. He reached out to Mr. Mayor, saying "My old adversary! I should take you back with me." Mr. Mayor prepared to fight off the ghost-like Venemon. Meanwhile Peabo still had his wood club and he tried hitting Venemon without much damage. The wood was not quite dense enough. Cole picked up one of the aluminum baseball bats with which he easily knocked the SCORPIOID down in his present low density state.

"We have to find a way to send him back and no one here can travel back right now." Said Mr. Mayor. At that moment Meso came to their attention. "I am not human and I have a quantum link to the other world. I will take Venemon back where he belongs and then work on research to help the bees to survive. Science used well can help get us out of this mess if we all work together."

" I don't want to go back! There is more mischief to be done here" Venemon could pass through wood, but not metal so Luella put a silver chain around his neck like a collar and then they tied on a leash. "Take him back Meso! We wish you well and we will do our part to help the bees survive and prosper here."

"Meso took the device with him. We do not have any way to get back through the portal now." Said Michael.

"It is probably for the best that travel thru the portal will end now. The contact between the alternate worlds has been dangerous and led to possible damage to both. We have done what we could." Mr. Mayor sighed.

Chapter 17: The End Of Camp

The Green Team enjoyed two days of games, good meals, and getting to know the fellow campers. They could not tell what they had done, so they said they had been on a field trip to a museum of insects and arachnids. They had learned a lot about bees, ants, spiders, and scorpions.

"Only you guys would love hanging around learning about creepy bugs." Greg from the blue team said. "You should have stayed here and played volleyball. The food must have been awful because you have all been pigging out since you got back."

Peabo replied, "You are right there Greg. The cricket kebabs are not as delectable as lamb, but they use fewer water and land resources and are more nutritious. I kind of liked the crunch too!"

"I called my Mother and asked her to bring some of the cricket protein snack bars from the store when she comes to pick us up tomorrow. Let's see who is brave enough to try one. When we taste tested them against other protein bars in the store most people liked them best and could not tell which had cricket protein powder." Luella challenged them all by looking each person in the eye for at least five seconds.

"Just remember we would not have many tasty foods, for instance almonds, if it were not for the bees pollination. One third of all agriculture depends on some "creepy bugs" Greg and I know you like to eat many of the fruits, nuts, and vegetables."

Cole added, "Bugs are also a source of food for many birds and small animals. The food chain depends on insects!"

Chapter 18: Going Home

The last day the families all arrived at the Camp to pick up their kids and enjoy a picnic lunch. Big tables were set with tasty food and drinks. Cole's Mother had gotten a ride with Michael's parent since there was room in their van for them all. Cole was very pleased to see that his Mother appeared in good health. "I think that you have grown a little Cole." His Mom was happy to see him relaxing with his friends.

The red and green teams were all joking and laughing together. They had a surprise practical joke for Greg. He had on a new blue ball cap, which he thought was a prize.

Sally and Grace went over to talk with Greg and grabbed his cap and threw it to Michael. Michael dipped it in a bucket and the wet cap turned red. They had dyed a white cap with an acid base indicator and there was vinegar in the bucket. "Go RED!" Everyone yelled.

"Thanks for the stink bomb Greg! Here is the pay back". Peabo was holding up the hat. Everyone was laughing now, even Greg.

" Now that you are on the red team Greg you can try one of the cricket protein bars made of creepy bugs." Hugo had already tried one and decided it tasted pretty good. The girls on the team thought they were fine but too sweet from the dates in the bar.

It was fun for Cole just to kick back after his adventure. He could not help wondering what was happening in Venemon's world, especially for the bees. Hopefully the new queen bee would make the hive a success. Cole was worried about the colony collapse disorder thought to be caused by infestation by varroa mites, virus and chemical toxins (neonicotinoid pesticides for example). He had to convince people like Greg that bugs were important to life on Earth not just a pest to eliminate.

Luella was thinking how nice it is to make some new friends and learn about more people. Introducing her friends to her sister Frannie and watching everyone interact socially was fascinating for Luella. Making social connections was what made her tick.

Peabo was glad to have his family present. After the adventure, it was nice to settle back into more normal life. He missed the competition because he always liked to set himself to perform his best. Games and contests helped push him further.

Michael was telling his Father and Mother all about his time, except the secret part, which he managed to not disclose. He was sharing all the great science he had learned at camp. His Father was pleased with his scientific approach and said "So now you believe in the science that got you through the challenges."

"You're right Dad. I don't believe in magic anymore. Magic is just science that we don't understand."

Chapter 19: Back to School

Cole was back to school, but no longer had to worry about food. His new friends took turns bringing extra things for Cole. He was not lonely anymore. The friends did homework together and usually someone kept Cole company on his paper route.

Cole's favorite class was Biology. Peabo, Luella, and Michael were all in the class together learning about all living things --- even bugs! When their teacher said "today we will learn about bees in class", they all looked at each other and smiled. Cole thought "I bet we know some things about bees that aren't in the book!"

Glossary

Agriculture - the science of farming, growing food for people. Example: growing corn
Did you know? Bees pollinate about 70% of major crops.

Arachnid - a "bug" with two body segments, eight legs, and simple eyes. Example: spiders. Did you know? Arachnids do not have wings. See Drawing at the end of this glossary.

BLQL - I made this upfront the story!

Chemicals - the material from which everything that you can touch, taste, and feel is made. Examples: Citric acid is a type of chemical called a carboxylic acid which contains the elements carbon, hydrogen, and oxygen. Organic chemicals whether natural or man made all contain the element carbon. These include alcohols, amines, amides, ethers and other groups. Did you know? Citrus fruit are high in Citric acid. Some lemons are as much as 8% Citric acid.

Colony Collapse Disorder - when most of the worker bees disappear from the hive, leaving the queen alone with some nurse bees and immature bees. The hive needs the worker bees to survive. Did you know? Most insecticides are toxic to bees.

Dark Energy - the universe is getting larger at an accelerating pace. The acceleration requires that a force is applied. Since we do not fully understand this force at this time it is called Dark Energy. Did you know? Scientists do not understand everything about the universe, but they know where the gaps in their knowledge exist. This is exciting for young scientists because there are still plenty of new discoveries to be made!

Dehydration reaction - a change in chemical(s) where a water molecule is removed to make a different substance. Did you know? Your body can make proteins from amino acids using a dehydration reaction.

Ecosystem - the interactions, including interconnecting exchange of matter and energy, between living things and their surrounding earth, air, and water at a location. Example: In the desert ecosystem the cactus uses the sunlight for energy and gets nutrients and water from the soil. Bees, bats, and hummingbirds pollinate the cactus and some birds nest in them.

Electromagnetic radiation - traveling radiant energy that has electric and magnetic components. This includes visible light, radio waves, microwaves, infrared, ultraviolet, and xrays. Did you know? This energy flows at the speed of light, 300,000,000 meters per second through a vacuum.

Entomology- the scientific study of insects. Did you know? An Entomologist studies the science of insects and their relationships to the environment and humans.

Enzyme - a biological catalyst that speeds up a chemical reaction so it can happen in a reasonable amount of time. Example: invertase is the enzyme that causes sucrose to break apart into fructose and glucose quickly at the temperature in the bee's honey stomach. Did you know? Most enzymes are made of protein.

Hexagon - a geometric figure with six sides. Example: honeycomb has mostly hexagonal compartments of wax to hold the honey. Did you know? The hexagons in the honeycomb are usually *regular* hexagons, meaning that they have all sides equal in length.

Honey - the bee product that is mostly close to equal percentages of simple sugars fructose and glucose.

Insect - a "bug" with three body segments, six legs, and compound eyes. Example: ants. Did you know? Most types of insects have wings and antennae. See drawing at the end of this glossary.

Mortar and pestle - a heavy bowl often made of stone (mortar) with a club shaped thick rod (pestle) used to grind ingredients to a paste or powder. Did you know? Humans have been using this tool since long ago. It was documented for use in preparing medicines in ancient Egypt.

Nectar- plants produce this sugary liquid to attract pollinators (like bees).

Neonicotinoid pesticide - imidacloprid and other related pesticides used to kill insects.

NONPOLAR- a covalent chemical bond between atoms where the electrons are shared equally. Example: oil. Polar compounds do not mix with NONPOLAR compounds.

Organic garden - a garden without synthetic pesticides, weed killers, or fertilizers. Did you know? Ladybugs can be used to get rid of aphids on roses instead of spraying pesticides.

Organisms - living things including plants, animals, bacteria, and fungi. Did you know? You are a human organism!

Parallel - when two straight lines will never intersect they are parallel. Example: if you extend the two lines in an equal sign = they would never cross each other.

Pentagon - a geometric figure with five sides.

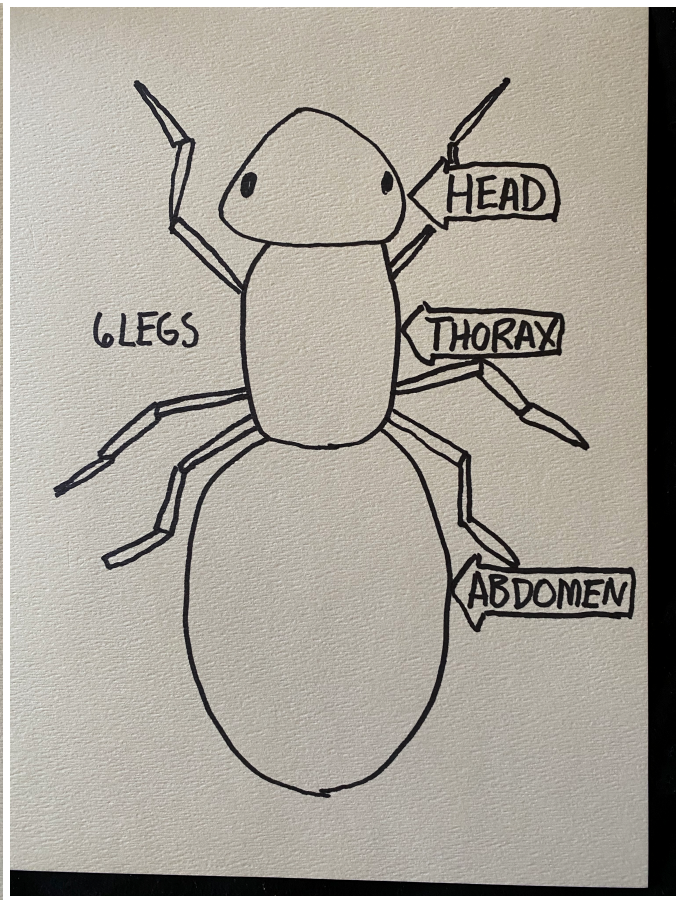
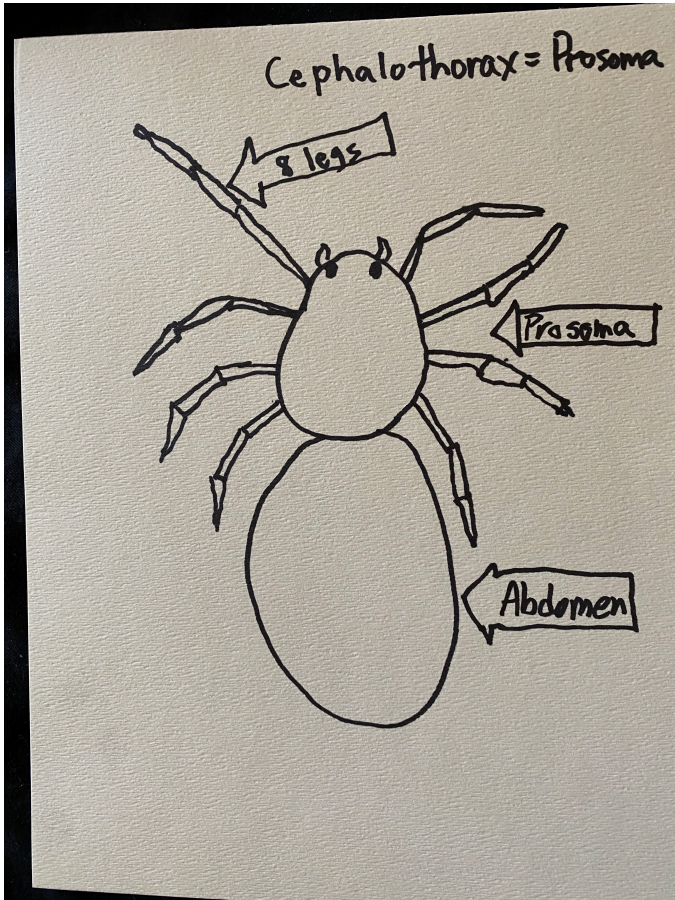
Polar - a covalent chemical bond where shared electrons are NOT shared equally. Example: water

Saliva - also known as spit. The liquid formed in the mouth

Sucrose - common table sugar. This disaccharide is formed from a glucose and a fructose bonded together by removal of a water molecule.

Toxins - poisonous chemicals that harm and can kill living things.

Wax - a substance that is not soluble in water made from an alcohol with many carbons reaction with a carboxylic acid with many carbons. Made by bees for hives to protect the honey.



Arachnid (left) versus Insect (right) Diagram



Dr. Diane Marsh was a Chemistry Professor for 26 years, opening her students eyes to the wonders occurring in the molecular world surrounding them. Her avocation has been presenting science lessons in a manner accessible to people of all ages --- from 4 year olds at the Early Childhood Development Center to teachers at the local schools. Dr. Marsh's interests include culinary chemistry and nutrition, green science, geology, and the chemistry of living things.