

# Mystery of the Mate: A Wasp Research Adventure

## PART 1

**Panel 1:** Close-up of Shannon speaking

Shannon: "Hello! My name is Shannon and I would like to join the insect lab."

**Panel 2:** Same shot of Shannon with eyes cast down, suggesting she's thinking about her wording

Shannon: "Hmm, no. Too demanding."

**Panel 3:** Two small heads of Shannon. First head shows a 'brain storm' with lightning and a cartoon brain. Second head has a floating hand with a finger pointing up.

Shannon: "I got it!"

**Panel 4:** Close-up of Shannon with eyes closed and holding up a 'young naturalist trophy' in one hand, and 'letters of reference' in the other

Shannon: "Dear sir or madam, I humbly request the honor of joining your lab. As you can see, I am regarded as an upstanding young biologist. Please consider my...application to...research... "

**Panel 5:** Shannon looking unsure, clutching her trophy and references close

Shannon: "Hrm...uhh..."

**Panel 6:** Shannon crying and throwing papers and trophy in exasperation

Shannon: "AUGH! They will think I'm a giant nerd!"

**Panel 7:** Shannon sitting slumped outside Entomology lab door that is clearly in a university hallway, with posters and fliers on walls

Shannon: "...I'm never gonna be a researcher... "

**Panel 8:** The door to the lab opens inward. Shannon falls backwards through it.

Shannon: "?!?!"

**Panel 9:** Shannon lying flat against the floor of the lab, her legs still sticking out the door. Looking down at her are Tamiya and Delmy.

**Panel 10:** Shannon's POV, looking up at Tamiya on the left and Delmy on the right, with hands up to her face in exasperation.

Tamiya: "Wow. You ARE a nerd."

Delmy: "TAMIYA!"

**Panel 11:** Shannon lying on the floor with teary eyes. Delmy and Tamiya's shoes are at the top of the panel.

**Panel 12:** Tamiya helping Shannon up from the floor  
Tamiya: “Oh, it’s OK, we’re nerds too. I’m Tamiya.”  
Shannon: “Um, thanks.”

**Panel 13:** Shannon on the left and Delmy to the right.  
Shannon: “Hi, I’m Shannon.”  
Delmy: “And I’m Delmy.”

**Panel 14:** Tamiya and Delmy slam hands together (a la ‘Dragon Ball Z’ fusion pose’)  
Tamiya and Delmy in unison: “AND TOGETHER WE ARE THE INSECT LAB SENIOR INTERNS”

**Panel 15:** Shannon looking a bit perplexed  
Shannon: “Oh. You two must really want to be entomologists.”

**Panel 16:** Tamiya and Delmy are still holding their ‘Dragon Ball Z fusion pose’  
Tamiya and Delmy in unison: “NOPE”

**Panel 17:** Tamiya on the left and Delmy on the right with cartoony drawings beneath them representing items from their desired career fields (an RX pill bottle and flask for Tamiya, a stethoscope and doctor’s coat for Delmy)  
Tamiya: “I’m studying to be a clinical lab scientist who will one day perform diagnostic tests on human samples.”  
Delmy: “And I’m going to go to medical school to become a physician – maybe a pediatrician.”

**Panel 18:** Shannon has an eyebrow raised  
Shannon: “Isn’t it odd for you two to be working in an entomology lab then?”

**Panel 19:** Delmy on the left facing Shannon. The bottom part of the panel shows an illustration of a flea and a mosquito.  
Delmy: “Not really! There are tons of medical connections to the study of insects. Lots of diseases are carried by insects like fleas and mosquitos. So as a future doctor, I think it’s important to study insects.”

**Panel 20:** Tamiya with examples of lab tools like pipette and test tubes.  
Tamiya: “And being in this lab gives me practice with all of the tools I’ll need to succeed. We study insect genetics, and many of the tools I’ll use as a professional are very similar!”

**Panel 21:** View from behind of Delmy and Shannon facing research space with a microscope and computer.  
Delmy: “By doing research in a biology lab, we’re gaining a better understanding of the scientific process. Both theoretical things, like developing a hypothesis, and practical things like how to use a micropipette.”

**Panel 22:** Close-up of Tamiya, Shannon and Delmy facing forward.

Tamiya: "Also, we needed research experience and Dr. T was the only professor accepting interns at the time."

Shannon: "Ah."

Delmy: "Yup."

**Panel 23:** Same view but zoomed out a bit.

Shannon: "Where is Dr. T any ways?"

Tamiya shrugging: "Who knows?"

Delmy: "They are a mystery."

**Panel 24:** Shannon looking perplexed and thinking.

**Panel 25:** Shannon opens mouth grinning with sudden realization

Shannon: "They must be out in the field collecting beautiful and shiny insects!"

**Panel 26:** Tamiya, Shannon, and Delmy with background collage of giant 'beautiful and shiny' insects like butterflies and iridescent beetles

Tamiya: "Beautiful and shiny insects?"

Shannon: "Yup, like butterflies and shiny beetles."

Delmy: "uh..."

**Panel 27:** Tamiya and Delmy (larger than life) looming over Shannon with glowing eyes and tented fingers.

Tamiya and Delmy: "THAT'S NOT WHAT WE STUDY."

Shannon: "eep! What do you study?"

**Panel 28:** Back to normal size, Tamiya is leaning on an insect cabinet, Delmy standing next to her. Shannon is facing the camera, with tears streaming down.

Tamiya: "Wasps."

Delmy: "Members of the order Hymenoptera, relatives to bees and ants."

Shannon: "NoooOooooooo"

**Panel 29:** Shannon with both hands in her hair, looking exasperated. To her left is her imagined version of a big, scary, very stingy social wasp

Shannon: "I can't study, or even be near, wasps! They are awful animals that chase you and sting you!"

**Panel 30:** Shannon walking away from others towards lab door.

Shannon: "This was a terrible idea. Thanks for letting me in, but I'll be going now."

Tamiya: "Alright, if you're sure."

Muffled voice from inside cabinet: "!!!"

**Panel 31:** The insect cabinet begins rumbling, Tamiya turns her head.

**Panel 32:** The insect cabinet begins violently rumbling, Tamiya looks shocked.

**Panel 33:** Dr. Tribull bursts out of the insect cabinet with arms outstretched.

**Panel 34:** Dr. Tribull with arms still outstretched and Tamiya looking on.

Tamiya: "HOW DID YOU GET IN THERE!"

Dr. T.: "Practice!"

**Panel 35:** All four standing in front of bookcase. Shannon with hand on the door.

Dr. T.: "Hi! I'm Dr. Tribull, or just Dr. T."

Tamiya: "Mystery solved."

Delmy: "YAY!"

Shannon: "That was...very weird and I'm going now."

**Panel 36:** Close up on Dr. T. with inset drawings of a paper wasp on a nest, another social wasp catching a caterpillar, and a social wasp pollinating a flower

Dr.T: "Wait! The wasps you're afraid of are social wasps. They build nests and only sting defensively when threatened. They might seem intimidating, but they're important predators of garden pests. And they even pollinate flowers and help plants to thrive."

**Panel 37:** Pie chart showing that social wasps are just a tiny percentage of all wasp diversity represented by very narrow slice

Dr T.: "But social wasps aren't really representative of most wasps. We think about them a lot, but they're only a small percentage of all wasps. Most wasps are tiny, solitary parasitoids that never interact with humans."

**Panel 38:** Shot of Shannon with wide eyes

Shannon: "Okay... so my fears might be a little... overblown. But what are parasitoids? I've never even heard of them before."

**Panel 39:** Tamiya on left with thumbs up and fake smile and Delmy with mouth open ready to interrupt

Tamiya: "They are totally normal and not gross wa--"

Delmy: "OOOOOoooo I CAN EXPLAIN!"

**Panel 40:** Three different types of parasitoid wasps that look very different from each other

Delmy: "There is a huge variety of parasitoid wasps. They tend to be very small, and they are all solitary and don't build nests. They find a living host to lay their eggs in. When those eggs hatch, the offspring feed on the host. In many cases, the host goes about life unaware that it's a moving buffet."

**Panel 41:** Parasitized caterpillar with an 'x-ray' view of wasp larvae eating it from the inside (saying 'nom'), and then a dead caterpillar host with a wasp popping out of it saying 'woo!'

Delmy: “But eventually, the developing wasps kill the host and emerge from the body, ready to start the cycle again. “

**Panel 42:** Tamiya has her hand slapped against her face in exasperation, Delmy is facing Shannon

Shannon: “So these are wasps that infect other insects with their babies?”

Delmy: “Yup.”

Shannon: “And then the babies eat the host from the inside and eventually burst out, killing it.”

Delmy: “Pretty much.”

Shannon: “Mmhmm, OK, I see...”

**Panel 43:** Shannon looking skeptical for a moment then with a large smile

Shannon: “Neat!”

**Panel 44:** Tamiya, Delmy, and Dr T. facing forward

Tamiya: “I can’t believe you pulled that off.”

Delmy: “It’s a gift.”

Dr. T.: “And it gets even better. Parasitoid wasps have the potential to help us!”

**Panel 45:** A field of corn with a zoom-in on a corn planthopper feeding on the stems.

Dr. T.: “When we farm, we tend to plant a lot of the same crop in one area, like a giant field of corn. This attracts insects, which often like the same food plants that we do. For example, there are planthoppers that will eat the sugary sap from corn, sucking away nutrients and transferring harmful bacteria at the same time. “

Planthopper: “Nom nom nom, I love sugar.”

**Panel 47:** A planthopper from the side feeding on a corn stem and a dryinid wasp sneaking up on it waving.

Dr. T.: “Left unchecked, a well-fed planthopper female could lay hundreds of eggs in her lifetime.”

Planthopper: “Gonna have so much energy to lay a ton of eggs!”

Drynid: “Hehehe, I think not!”

**Panel 48:** An almost dead planthopper that’s being parasitized by a dryinid larva

Dr T.: “When parasitoid wasps use these pest insects as hosts, they help to control a population that might otherwise destroy OUR food.”

Planthopper: “Dangit.”

**Panel 49:** Shows large green beetle on a tree with the bark peeled away to show the damage from wood boring beetle larvae

Dr T.: “Besides agricultural systems, parasitoid wasps can also help to control invasive insects that are destroying trees. The emerald ash borer is an invasive beetle whose larvae severely damage tree tissue and can transmit harmful bacteria.”

**Panel 50:** A bethylid wasp munching on a wood-boring beetle larvae

Bethylid Wasp: “Ooo, a meal for my babies!”  
Beetle Grub: “Darn!”

**Panel 51:** Shannon trying to process this information

Shannon: “Okay, so... in theory you could release a population of these wasps and they’d control pests for us instead of having to spray pesticides?”

Shannon thought bubble: Shannon tossing wasps saying “FLY MY PRETTIES.”

**Panel 52:** Small head of Dr. T above a view of a lab rearing parasitoid wasps in experimental cages

Dr. T.: “In theory, we could! In fact, there are already labs that breed parasitoid wasps and study how effective they are at controlling known agricultural pests.”

**Panel 53:** A bethylidae wasp on a parasitized wood-boring beetle larvae on the left and a dryinidae wasp on the right, parasitizing a planthopper

Dr. T.: “In our lab, we study wasps in the families Bethyidae and Dryinidae. Agricultural entomologists COULD one day use species of Bethyidae and Dryinidae as biocontrols, but we can’t yet.”

Wasps: “Why not?!?!”

**Panel 54:** A male and female Dryinidae facing each other with a heart in the middle

Dr. T.: “In species of both Bethyidae and Dryinidae, males and females can look incredibly different—almost like they’re from different species entirely! This is known as sexual dimorphism.”

**Panel 55:** Anglerfish female on left with the tiny male attached to her and a male peacock on right showing off

Dr. T.: “Sexual dimorphism exists in other animals. But biologists can associate members of the same species when they observe living examples, courtship behavior, or mating.”

**Panel 56:** Jar of insects labeled “Bug Soup” Malaise Trap with arrows expanding out to circles showing different examples of male and female dryinidae.

Dr. T.: “But most Bethyidae and Dryinidae that have been described were collected dead! If you collect multiple different males and females in one trap, none of them would look the same. And none of them were observed mating.”

**Panel 57:** Taxonomy book with a female dryinid drawn under Species 1 and a male dryinid drawn under species 2. Description for the female in species 1 says Member of genus *Gonatopus*. Species is known from females only. Distribution: New York State. Description for species 2 which looks different says Member of genus *Gonatopus*. Species is known from males only. Distribution: New York State.

Dr. T.: “Each different looking wasp would be described as a new species. And now there’s many species where only one sex is known and the other is unknown!”

**Panel 58:** Dr. T holding up examples of a female dryinid and a male dryinid.

Dr. T.: “Until we can revise species descriptions of these wasps to include BOTH sexes, we can’t start breeding them and using them in agricultural or ecological studies as biocontrols on pests. In this lab, we try to solve the mystery of ‘Who is the mate?’ “

Wasps: “We’ll never tell!”

**Panel 59:** Shannon looking intensely at Dr. T.

Shannon: “IT IS DECIDED. I will help you solve these mysteries.”

Dr. T.: “Cool.”

Shannon: “Just tell me what you need me to do, Doctor T.”

**Panel 60:** Zoomed out to see all four standing together with Delmy nodding and Dr. T crying.

Tamiya: “AHEM. You’ve got a lot to learn, new girl. And we senior lab interns will be teaching you. “

Dr. T.: “My interns are growing up, so proud.”

**Panel 61:** Close up on Delmy with finger pointing up

Delmy: “First part of solving the mystery: We need to catch ourselves some insects out in the field!”

End of Part 1!