

# SCIENTISTS IN THE FIELD *Where Science Meets Adventure*

DISCUSSION AND ACTIVITY GUIDE

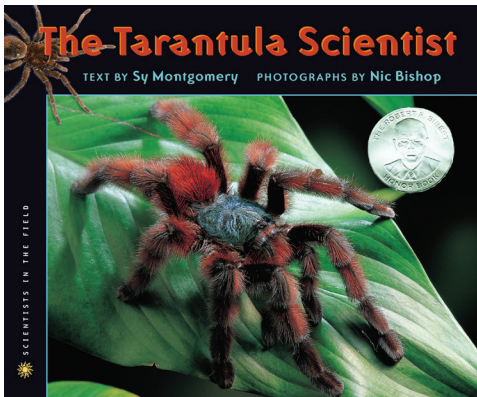
## *The Tarantula Scientist*

BY SY MONTGOMERY PHOTOGRAPHS BY NIC BISHOP

### *About the Series*



*The Tarantula Scientist* is part of the award-winning Scientists in the Field series, which began in 1999. This distinguished and innovative series examines the work of real-life scientists doing actual research. Young readers discover what it is like to be a working scientist, investigate an intriguing research project in action, and gain a wealth of knowledge about fascinating scientific topics. Outstanding writing and stellar photography are features of every book in the series. Reading levels vary, but the books will interest a wide range of readers.



*The Tarantula Scientist*  
by Sy Montgomery  
Photographs by Nic Bishop

### *About the Book*

What brings the scientist Sam Marshall from Hiram College in Ohio all the way to the rainforests of French Guiana, where he has to watch out for poisonous snakes, wasps, biting ants, wild pigs, and treacherous trails? It is his fascination with a super spider: the Goliath birdeater tarantula, the largest species of spider on the planet. Very little is known about this creature, and Dr. Marshall is intent on learning more. Sy Montgomery and Nic Bishop chronicle Dr. Marshall's fascinating research in this Robert F. Sibert Honor book, also exploring what drew Dr. Marshall to scientific research as his career.

### *About the Author*

While researching some of her many books, Sy Montgomery has been bitten by a vampire bat, hugged by an octopus, and hunted by a tiger, and she has crawled into a pit with 18,000 snakes! She has written more than twenty books for adults and children and has won many honors, including the Orbis Pictus Award, a Robert F. Sibert Award, the Henry Bergh Award for Nonfiction, and many more.

Besides writing books, she is a screenwriter for film and television and a popular speaker. She works with many organizations to preserve and protect nature. Montgomery lives on a farm in New Hampshire with her husband and many animals.

### *About the Photographer*

Nic Bishop is the photographer for *Chasing Cheetahs*, but has also had more than seventy books published and holds a Ph.D. in biology from Canterbury University. Nic's parents were biologists too, and because of their jobs, Nic grew up in Bangladesh, the Sudan, and Papua New Guinea. He started taking pictures as a child with his sister's Brownie camera, and he has been photographing animals and the wild and remote places they live ever since. Nic and his wife moved to the United States in 1994.

Houghton Mifflin Harcourt Books for Young Readers

Visit [www.sciencemeetsadventure.com](http://www.sciencemeetsadventure.com) for authors' Adventure Notes, teacher resources, videos, and more!

*The Tarantula Scientist*

BY SY MONTGOMERY PHOTOGRAPHS BY NIC BISHOP

Bishop has won many awards for his books, including three Robert F. Siebert Honor awards, the Orbis Pictus Award, and the Boston Globe–Horn Book Award.

*Pre-Reading Activity*

Think about a time in which you or a family member or a friend hid from others. Discuss the factors that forced the person into hiding. What made the person come out of hiding? Make a list of all the other variables that could induce a person to come out from his or her hiding spot. Make a list of the factors that would cause the person to remain hiding. What do these ideas have in common? Have you ever tried to lure a pet or other animal out of a hiding spot? What did you do?

Develop a class definition of *pests, weeds, parasite, monster, alien, weirdo, freak, oddball, geek*, and other words that have somewhat negative connotations. Do these definitions have common denominators? Is this label, when applied to animals or plants, immutable? If not, what happens to change, say, a pest into a welcomed member of a habitat?

Collect as many picture books or songs about spiders as you can find. Sort them into categories that indicate whether the spider is a pest or a beneficial organism. Notice in the picture books whether or not the spider is drawn based on an actual spider and, if so, which kind of spider is depicted. Are the other creatures and objects in the book drawn to scale compared to the actual size of the spider? What does this suggest?

*Discussion Questions*

What animals are pests? How much of our definition of pests stems from ignorance? How much of our pest definition stems from ecological imbalances? How much stems from human selfishness?

What would happen to flies, moths, and other animals if spiders became extinct? Could it ever become necessary to protect mosquitoes, spiders, cockroaches, or other animals commonly labeled as pests?

Think about the nursery rhyme, “Little Miss Muffet.” What scared Miss Muffet away and why (and extra credit for defining tuffet)? Are you more of a Miss Muffet person or more of a spider person?

If students have seen *Arachnophobia* or *Spider-man*, what elements of these movies reflect accurate information about spiders and where is the exaggeration? Spider silk is incredibly strong! This FACT forms the basis of the Spider-man cartoons and movies. Think about other animals or plants and their special traits. What new animal or plant will form the basis of our next movie or cartoon superhero?

Tarantulas have existed for longer than the dinosaurs. Why? How?

Many people regularly complain that they are misunderstood. What is something about you that other people just do not understand? Or, if this is not a concern, how do you go about making sure that people do understand you?

Think about something you enjoy doing. Now think about sacrifices you would be willing to make in order to keep doing this activity. How much are we willing to sacrifice in order to do a job we enjoy? When does the price of the sacrifice force us to move to other activities? Now change the terminology from “something you enjoy doing” to “something that must be done.” Is there still a point in which the sacrifices are just too much?

Are tarantulas scarier than other spiders?

*Applying and Extending Our Knowledge*

On page 51 we read, “*But all spiders make silk. It’s quite a feat. Spiders make silk from glands inside their abdomens, extruding it through special spigots on their undersides called spinnerets. Some spiders can produce up to seven different kinds of silk.*” Some spiders spin seven different types of silk that differ in how tough they are. “Toughness” is an actual measurement. How hard is it to fracture the material? Spider silk is also elastic, or stretchy.

## The Tarantula Scientist

BY SY MONTGOMERY PHOTOGRAPHS BY NIC BISHOP

- Find the toughness of a paper towel, a tissue, and toilet paper (use the same brand for all students). Using a small plastic bowl, marbles (same size and weight), and rubber bands large enough to hold the paper over the bowl, drop marbles onto the paper from two feet above. Did any of the paper rip? Repeat from different heights. What is the relative toughness of the papers tested? Repeat with different brands or heavier marbles, etc.
- Use six different string colors or types to design a chart showing the different kinds of spider silk. Explain its function. Put in order from the toughest to the least tough.
- Touch a cobweb or an empty spider web with a bare hand. Then touch it again with a bit of vegetable oil on your finger. Explain how spiders do not get stuck in their own webs.
- Some spiders build webs, some use silk as a lure, and tarantulas have a welcome mat of silk. Create an online presentation or a poster showing all the different ways that spiders use silk. Be sure to include examples of the actual spiders that use the silk in the way you have shown. Be sure to include all of the examples listed in this book and then see how many more you can find.
- Watch Cheryl Hiyashi's fifteen-minute TED talk about the magnificence of spider silk:  
[www.ted.com/talks/cheryl\\_hayashi\\_the\\_magnificence\\_of\\_spider\\_silk.html](http://www.ted.com/talks/cheryl_hayashi_the_magnificence_of_spider_silk.html)

On page 7, we read, "*Sam is a spider scientist, or arachnologist. . . . His specialty? The biggest, hairiest, and, some would say, scariest group of spiders on earth: tarantulas.*"

- Begin the exploration of this book by having each class member write down all the facts they know about tarantulas and spiders and all of the myths they know about them. Consolidate the information and keep for reference as students proceed through the book. Make sure to confirm the facts on your list by citing the page numbers that confirm the information OR to move the fact over to the myth and folklore section when a "fact" is proven false (include the page numbers here as well).
- In addition to confirming or rejecting facts students

- have listed, make sure to add important facts that were neglected upon creation of the list.
- Go back to some of the books, rhymes, or movies from the discussion questions. Create a Venn diagram showing the differences between real tarantulas and spiders and the make-believe, Hollywood versions. List the differences as well as the similarities. Discuss the kernel of truth the authors or directors use to exaggerate the fear factor. Why are so many people so terrified over these spiders? As big as a tarantula is, it would not survive if you stepped on it.
- Design an ad campaign to accentuate the benefits of tarantulas to our world. If possible, make a sixty-second promotional video that can be shared electronically and shown at your school.
- Do a satirical video exposé (in a 60 Minutes' like format) outlining the slander and libel in fiction and media directed toward the tarantula.

### Common Core Connections

CCSS.ELA-Literacy.RST.6-8.1

Cite specific textual evidence to support analysis of science and technical texts.

CCSS.ELA-Literacy.RST.6-8.2

Determine the central ideas or conclusions of a text; provide an accurate summary of the text distinct from prior knowledge or opinions.

CCSS.ELA-Literacy.RST.6-8.3

Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.

CCSS.ELA-Literacy.RST.6-8.8

Distinguish among facts, reasoned judgment based on research findings, and speculation in a text.

CCSS.ELA-Literacy.RST.6-8.9

Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic.

CCSS.ELA-Literacy.W.7.7

Conduct short research projects to answer a question, drawing on several sources and generating additional related, focused questions for further research and investigation.

CCSS.ELA-Literacy.W.7.8

Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation.

CCSS.ELA-Literacy.W.7.4

Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and

*The Tarantula Scientist*

BY SY MONTGOMERY   PHOTOGRAPHS BY NIC BISHOP

audience. (Grade-specific expectations for writing types are defined in standards 1-3 above.)

CCSS.ELA-Literacy.W.7.6

Use technology, including the Internet, to produce and publish writing and link to and cite sources as well as to interact and collaborate with others, including linking to and citing sources.

CCSS.ELA-Literacy.RST.6-8.7

Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table).

On page 16 we read, *“The tropical tarantulas and their relatives were on Earth long before the Mediterranean tarantula.”* Later on we read that there are about 850 kinds of tarantulas alone, one of the most diverse group of spiders on the planet.

- Make a tropical tarantula card deck, much like a baseball card or Pokémon card. Include nonfiction facts about the various tropical tarantulas. Use online color pictures or color illustrations of the tarantulas. Try to find pictures that are the actual size of the tarantula to use. Make sure the facts include basic biological information: description, range, habitat, diet, general behavior, predators and other threats to the tarantula, an overview of the health of the tarantula, and other interesting facts. Using these facts, create a tarantula card game.
- Do the same thing for the Mediterranean tarantula and other spiders.
- Create a visual (online or poster) presentation describing how tarantulas fit into the arachnid group. Make sure the presentation includes a labeled drawing of one or more tarantulas or spiders, illustrations of ranges, and an indication of the size of the various populations.
- If time and interest permits, find music that matches the Goliath birdeater tarantula behavior. On page 8, we read, *“She thunders out of the hole! Her eight walking feet, each tipped with two claws called tarsi, patter loudly on the dead leaves on the forest floor. ‘These tarantulas are the jaguars of the leaf litter,’ Sam says. And it’s true—to the frogs and worms and insects who live here, this tarantula must be an awesome predator.”* But make sure to balance this with the information later in which we learn that Sam has never been bitten and that the tarantulas would rather be left alone. Create

a dance or a skit or a play that accurately describes this large spider.

*Common Core Connections*

CCSS.ELA-Literacy.W.7.7

Conduct short research projects to answer a question, drawing on several sources and generating additional related, focused questions for further research and investigation.

CCSS.ELA-Literacy.W.7.4

Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. (Grade-specific expectations for writing types are defined in standards 1-3 above.)

CCSS.ELA-Literacy.W.7.3

Write narratives to develop real or imagined experiences or events using effective technique, relevant descriptive details, and well-structured event sequences.

On page 23 we learn that Sam did not do well in school. *“He got bad grades even in biology.”* Everything changed for Sam when he did a project on tarantulas.

- Discuss in small groups the factors that cause you to love science or not love science. Make a list of science projects that have the potential of increasing your interest in science and a list of projects that turn you off. Examine to see whether or not the different projects that make you like or not like science (or any subject) hold anything in common. Have you ever done a science project that was not dictated by a teacher? Why (or why not)?
- Maybe you would not risk bumping your head into wasp’s nest to study tarantulas, but are there any animals or plants that would have you increasing your personal discomfort to study? Discuss in groups which animals would cause you to put up with the risk of bites, stings, and other physical annoyances and injuries. Are tarantulas worth studying, even if you are not the one to do it? Where would tarantulas fit on your prioritized list of, the most likely animals you would study if you were a field biologist?
- Debate the necessity and priority of studying tarantulas in a world with many needs and many competing priorities. Research the cost of flying to French Guiana and staying there for several months each year. How many people would need to go? What precautions would need to be taken? What supplies would be needed? What would the expected short-

*The Tarantula Scientist*

BY SY MONTGOMERY   PHOTOGRAPHS BY NIC BISHOP

term and/or long-term benefits be for these trips? What other regional and national priorities compete with the study of tarantulas? Set up a trial with a prosecutor, defense attorney, judge (or group of judges—like the Supreme Court), and a jury. Spend a few days reviewing the evidence (or as much time as possible) and then have the judges present their written ruling explaining what we should do in terms of tarantula research.

- Poll your student body either in person or via an online survey, such as Survey Monkey, to find out what your students know and feel about tarantulas. Use the survey results to plan an informational campaign supporting tarantulas and attempting to improve the perception of these animals.
- Research insects with venom. Make a chart of all the insects that produce poison. Make a chart showing the type of venom, the amount produced, and how toxic the venom is. What do you predict this venom, in the amount produced by the spider, would do to a baby that weighed 10 pounds, a student that weighed 100 pounds, or an adult that weighed 200 pounds?

*Common Core Connections*

CCSS.ELA-Literacy.SL.7.1

Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 7 topics, texts, and issues, building on others' ideas and expressing their own clearly.

CCSS.ELA-Literacy.SL.7.1.a

Come to discussions prepared, having read or researched material under study; explicitly draw on that preparation by referring to evidence on the topic, text, or issue to probe and reflect on ideas under discussion.

CCSS.ELA-Literacy.W.7.7

Conduct short research projects to answer a question, drawing on several sources and generating additional related, focused questions for further research and investigation.

CCSS.ELA-Literacy.W.7.4

Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. (Grade-specific expectations for writing types are defined in standards 1-3 above.)

On page 26 we see more evidence that science is driven by a need to answer questions. On this page, the question is about where the Goliath birdeaters live. Your neighborhood probably does not have any Goliath birdeaters, but it probably does have a

variety of spiders, maybe even a tarantula or two. Please use caution in approaching spiders, as some can be dangerous. Please keep your students under supervision, and mention that spiders are also fragile. For all these reasons, spiders should not be handled, but observed at a safe distance only.

- Using a digital camera, take a census of all the spiders you can find in your school and nearby area. Create a field guide to the spiders of your area using these pictures. Work with your classmates, teacher, and school librarian, and other professionals to identify the spiders you find. What other questions do you have about the spiders you find? Outline the process, time, and materials necessary to answer the questions from the class.
- Find a spider or several spiders in your area that you can observe for an extended period of time. Create a field journal in which you post your daily pictures and your picture annotation. Review reasons for dating and signing field journal, as well as accurately describing the location.
- Divide the class into groups and have certain groups specialize in different types of spiders or spider prey (in addition to their field journal work).
- Create a class booklet of the questions students have written. When appropriate, have these questions guide the next day's observations. Have other students use their own observations to formulate answers or theories concerning the questions.
- The activities above may also be used by students in outdoor areas of their own choosing (and assigned as homework or extra credit). Discuss with students whether a field journal could even be done in, say, the lunchroom.
- Compare the class predictions before starting with what the class observes monthly (and at the end of the time period). What new predictions and hypotheses do the students have?
- Since this book was published, more research has accumulated about tarantulas. Do an online search for the most recent discoveries or findings. What has changed? Present this information to the class and come up with new theories about what a tarantula scientist should do next.

## The Tarantula Scientist

BY SY MONTGOMERY PHOTOGRAPHS BY NIC BISHOP

- Using recycled materials, make a model of the Goliath birdeater habitat. As much as possible try to disguise the entryways to the spider den, keeping in mind that Sam and his crew found that the dens were easier to find when they traveled uphill. Write an annotation justifying your artistic decisions recreating this habitat.
- Invent a make-believe tarantula and create a habitat for this creature using recycled materials. Create a trading card for your make-believe tarantula based on the card game activity described earlier.

### Common Core Connections

CCSS.ELA-Literacy.W.7.10

Write routinely over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

CCSS.ELA-Literacy.W.7.4

Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. (Grade-specific expectations for writing types are defined in standards 1-3 above.)

CCSS.ELA-Literacy.W.7.7

Conduct short research projects to answer a question, drawing on several sources and generating additional related, focused questions for further research and investigation.

CCSS.ELA-Literacy.W.7.8

Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation.

CCSS.ELA-Literacy.RST.6-8.3

Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.

CCSS.ELA-Literacy.RST.6-8.1

Cite specific textual evidence to support analysis of science and technical texts.

CCSS.ELA-Literacy.RI.7.8

Trace and evaluate the argument and specific claims in a text, assessing whether the reasoning is sound and the evidence is relevant and sufficient to support the claims.

CCSS.ELA-Literacy.RI.7.9

Analyze how two or more authors writing about the same topic shape their presentations of key information by emphasizing different evidence or advancing different interpretations of facts.

The caption on the picture on page 34 states that New World tarantulas brush clouds of irritating hairs from their abdomen to deter would-be predators. These

hairs are like airborne darts and can leave a predator itching for weeks.

- Research the various threats to tarantulas and other spiders. Make a list of predators, biological threats, environmental threats, and other threats that tarantulas must defend against. Rate the threats according to the severity. For each threat, describe (if possible) steps that tarantulas take to minimize the threat. Are there any threats that require human intervention? Justify your answer.
- Describe in your own words how these airborne hairs from the belly of the tarantula could cause itching for weeks.
- One threat to tarantulas is that people eat them. Write down your reaction to eating a tarantula. Then try to look at eating the tarantula from a nutritional standpoint. How much does one weigh? How would one prepare it? How many would one have to eat to be full? How much protein? Keep in mind that millions of organisms live in wheat fields, etc. and that we probably consume more insects than most other countries (although the insects we consume are ground into microscopic pieces). Think about how our emotions dictate our diets and discuss in groups. Do all countries feel the same about consuming insects?

### Common Core Connections

CCSS.ELA-Literacy.W.7.7

Conduct short research projects to answer a question, drawing on several sources and generating additional related, focused questions for further research and investigation.

CCSS.ELA-Literacy.W.7.4

Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. (Grade-specific expectations for writing types are defined in standards 1-3 above.)

CCSS.ELA-Literacy.SL.7.1

Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 7 topics, texts, and issues, building on others' ideas and expressing their own clearly.

On page 63 we read, *“The Goliath birdeater tarantula, Sam discovered, produces sound in a manner unknown in any other living creature. And in making this discovery, he proved—once again—that these primitive ‘spider dinosaurs’ are actually far more sophisticated than anyone had thought.”*

*The Tarantula Scientist*

BY SY MONTGOMERY PHOTOGRAPHS BY NIC BISHOP

- Earlier we read about the Goliath birdeater making noise walking in the dry leaves. Now we see this tarantula making music with hairs that function somewhat similar to Velcro. Compose a piece of music using just Velcro and dry leaves. Then group together other insect sounds with the spider music. Perform this for younger students. Go through this book and find artistic portions of spider pictures to magnify for an art show to go along with the music. Look at the picture on page 62 and draw pictures in this style to display while listening to the spider and insect music.
- Write a poem or tall tale explaining why spiders make silk. Present this work to a local senior center. If time permits, design a program of music, dance, poetry, and nonfiction research on the importance of tarantulas and other spiders to share with seniors or elementary students (or both).

*Common Core Connections*

CCSS.ELA-Literacy.W.7.7

Conduct short research projects to answer a question, drawing on several sources and generating additional related, focused questions for further research and investigation.

CCSS.ELA-Literacy.W.7.3

Write narratives to develop real or imagined experiences or events using effective technique, relevant descriptive details, and well-structured event sequences.

CCSS.ELA-Literacy.W.7.4

Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. (Grade-specific expectations for writing types are defined in standards 1-3 above.)

*Print Resources*

Heos, Bridget. *Stronger Than Steel: Spider Silk DNA and the Quest for Better Bulletproof Vests, Sutures and Parachute Ropes*. 2013. Houghton Mifflin Harcourt.

*Other Websites to Explore*

Tarantula Facts

[www.livescience.com/39963-tarantula.html](http://www.livescience.com/39963-tarantula.html)

Information on tarantulas and from Live Science.

Goliath Bird-Eating Spider Facts

[www.arkive.org/goliath-bird-eating-spider/theraphosa-blondi](http://www.arkive.org/goliath-bird-eating-spider/theraphosa-blondi)

Information on the Goliath Birdeater Tarantula and links to recent research from Wildscreen Arkive.

Arachno Web

[www.arachnology.org](http://www.arachnology.org)

Website of the International Society of Arachnology. Provides a list of websites, some for kids, on identification, information, and resources on spiders and webs.

Guide created by Ed Spicer, curriculum consultant, and Lynn Rutan, retired middle school librarian, now reviewer and blogger at *Bookends: The Booklist Youth Blog*.