SCIENTISTS IN THE FIELD

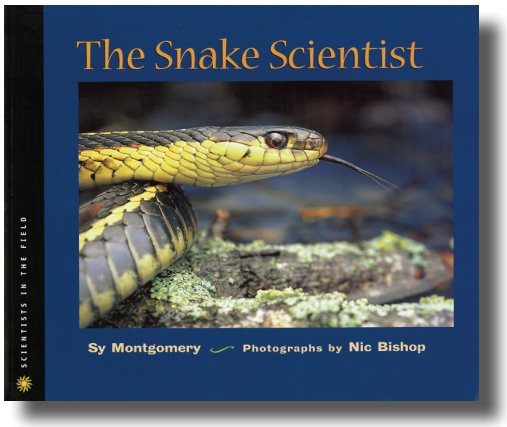
WHERE SCIENCE MEETS ADVENTURE

DISCUSSION AND ACTIVITY GUIDE

The Snake Scientist
by Sy Montgomery Photographs by Nic Bishop

About the Series

The Snake 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.



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About the Book

Grabbing handfuls of writhing, slithering snakes and stuffing them in sacks is just one of several aspects of *The Snake Scientist* that will lure future biologists and scientists to yet another visually and intellectually stimulating examination of what scientists do to further our understanding of our world. Readers journey with Bob Mason and crew as they discover "snake juice," the first discovered reptile pheromone. This discovery not only helps scientists discover how red-sided garter snakes find their mate, but also may hold the key to understanding animal migration.

About the Author

The author Sy Montgomery's life would make a fascinating book. While researching some of her many books, she has been bitten by a vampire bat, hugged by an octopus, hunted by a tiger, and in a pit with 18,000 snakes! She has written more than fifteen books for adults and children and has won many honors including the Orbis Pictus Award, the Robert F. Sibert Award, the Henry Bergh Award for Nonfiction, and many more.

Sy is an ardent conservationist. Besides writing books, she is a screenwriter for film and television, a columnist for the *Boston Globe,* and a popular speaker. She works with many organizations to preserve and protect nature. Sy lives on a farm in New Hampshire with her husband and many animals.

Nic Bishop is the photographer for *The Snake Scientist* and he is also the author of more than sixty books. Nic 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.

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Nic has won many awards for his books including a Robert F. Sibert Medal (and three Honor Awards), the Orbis Pictus Award, and the Boston Globe–Horn Book Award.

Pre-Reading Activity

At Halloween parties students regularly plunge their hands into globs of cold spaghetti, which the horror-master claims with the voice of doom are human brains or intestines. Peeled grapes become eyeballs. The whole purpose of this fun is to evoke a natural predisposition to shudder with revulsion and fear. In small groups make a list of other icons of fear and discuss the steps we take to manage these fears, if not completely overcome them.

Discuss ways in which fears and superstitions have come back to haunt us with other scary animals like wolves, spiders, bats, sharks, and others.

Discussion Questions

When a community decides to build a neighborhood out of formerly wild lands, what (if any) concessions should be given to the plant and animal life that preceded the new housing development? Does it make any difference if the animals are creatures like snakes, spiders, coyotes, scorpions, wolves, or other similar creatures?

Look at the three pictures on page 5. How do we teach ourselves to become comfortable with creatures that frighten us? How much have our own cultural customs and attitudes toward snakes influenced how we view snakes and how we react when we unexpectedly come into contact with one? Red-sided garter snakes are harmless—does this matter in terms of our fear? Does this answer change if the snake is a rattlesnake?

What benefits to an ecosystem do snakes, bats, spiders, et al. provide? Look at the logo of the American Medical Association. Why snakes?

The benefits from creatures like snakes often are masked beneath our fear of these creatures. What steps should a community take to insure that snakes become a respected and appreciated member of our shared ecosystem (even if they are never loved or our favorite organisms)?

Why have snakes been so successful in evolutionary terms, existing as a species even longer than dinosaurs?

Applying and Extending Our Knowledge

On pages 11 and 12 Montgomery states that red-sided garter snakes are born in the marshes but do not return to the snake den until they are two years old. At the end of the book the question of where the snakes go for their first two years is listed as an unsolved mystery.

- Research the Narcisse Wildlife Management Area in Manitoba, Canada. Look at pictures and videos of the area. Read descriptions of the area around the dens. Make an independent prediction for where newborn snakes spend their first two years of life. Make sure to consider water sources, food sources, and protection from predators.

- After students have formed an independent prediction for how young snakes spend their first years of life, form groups and share predictions. Evaluate the pros and cons of each member's prediction.

- Make a group prediction based on the evaluation of each individual prediction and suggest several methods for testing the group prediction. Keep in mind this quote from page 17: *"Think of it: these are cold-blooded animals, yet they're living where it can snow eight months out of the year. 'These snakes are living on the edge,' says Bob. 'This is a harsh environment for a reptile. If they don't make it back to the den in September they won't survive.'"* How, then, could newborn snakes survive?

Montgomery states that when a two-year-old snake enters a den for the first time, it will return to the same den year after year. Snakes receive, according to the text, *"a temporary stripe of color made with a marker on their bellies or with a silver letter painted on their heads."* (p. 11)

- If the marking is only temporary, how do scientists know the same snake returns to the same den? Discuss. In groups, discuss why scientists would not want to permanently mark snakes. Discuss why there is not any mention of tagging snakes. Discuss ways in which your group would go about determining how one could prove that a snake comes back to the same den.

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- Does the number of snakes and the number of dens suggest other ways to prove that snakes return to the same den? If so, share with the class the mathematical data that suggests a proof.

- Bob Mason discovered that these snakes live about nine years and travel about twenty miles. How do these numbers factor into the mathematical proof above? Discuss ways in which Bob could determine how far a snake travels and how long this species lives (on average).

Common Core Connections

CCSS.ELA-Literacy.WHST.6-8.9 Draw evidence from informational texts to support analysis reflection, and research.

CCSS.ELA-Literacy.WHST.6-8.1b Support claim(s) with logical reasoning and relevant, accurate data and evidence that demonstrate an understanding of the topic or text, using credible sources.

Bob Mason tested hundreds of chemicals before he found the pheromone, the "snake juice" that allows snakes to identify an individual snake. These pheromones, Mason predicts, may also explain how these snakes navigate from the marshes where they give birth and feed to the dens where they spend the winters.

- Collect a large set of objects that are all identical (or close). Maybe it is a deck of cards (use only the back of the cards). Take about a tenth (or less) of the objects and mark them with a scent (almond extract, peppermint, etc.). Now place these scented items in a zigzag path from point A to point B. Use the non-scented items to make following the path visually confusing and as close to impossible as feasible. Have students attempt to navigate the correct path without touching the cards and using just the odor of the scent-marked items. You may want to assign coordinates to all the cards and have students record the correct sequence of the scented objects from the two reference points. You will want just enough scent-tagged items to allow students to find and follow the path, but not so many that there is no challenge to finding the correct object.

- In order to successfully mate, the male has to find which of the virtually identical-looking snakes is the female. This is accomplished by finding the correct pheromone. Pheromones are a chemical trace that animals sense in ways humans might describe as tasting. Assuming there are no food allergies among students, have one student taste something like a peanut butter cracker or a small piece of mint chocolate without telling anyone what he or she tried. Have the rest of the class taste a similar-looking snack without revealing what was tried. Either make all the snacks look identical or blindfold students tasting them. On this plate of snacks, provide just one or two samples that are the same as the peanut butter cracker or mint chocolate described above. After each student tries a snack, the chosen person tries to find the match by asking each student what he or she tasted. This activity can be done as a race (for fun) or to just demonstrate (along with the last activity) that pheromones are more than just an odor.

Reptiles are cold blooded, which means they take their internal temperature from the environment. Mason suspects that even though his park has created tunnels beneath the road for the snakes, they still chose the highway because the warm asphalt feels better to the snake.

Repeat the path game above, but this time use objects that are warmer and colder. And this time keep the objects close enough together that a blindfolded student could follow the warmest path with his or her hand. The goal in this activity is to veer the student (snake) around the danger area (the highway).

Common Core Connections

RST.6-8.3. Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.

W.6.7. Conduct short research projects to answer a question, drawing on several sources and refocusing the inquiry when appropriate.

Michael, one of the researchers, believes these snakes provide a good model for understanding animal migration in general.

- Compare the snake migration described in this book with animal migration of at least two different species. Make charts or presentations showing how they compare and contrast.

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- Is there enough evidence in the book to compare migration patterns between different species? Present your case. If there is not enough evidence, what other evidence would the class need to see first? Does this evidence exist? Check with your school librarian (or public librarian) and prepare an annotated list of references.

Common Core Connections

RH.6-8.7. Integrate visual information (e.g., in charts, graphs, photographs, videos, or maps) with other information in print and digital texts.
RI.6.7. Integrate information presented in different media or formats (e.g., visually, quantitatively) as well as in words to develop a coherent understanding of a topic or issue.

W.6.7. Conduct short research projects to answer a question, drawing on several sources and refocusing the inquiry when appropriate.
CCSS.ELA-Literacy.RI.6.8 Trace and evaluate the argument and specific claims in a text, distinguishing claims that are supported by reasons and evidence from claims that are not.

While much of this book explores how scientists discovered, isolated, and then used snake pheromones to learn about snake behavior, the basic garter snake biology is scattered through the text.

- Prepare an illustrated field guide page (patterned after, say, a Peterson Field Guide) for the red-sided garter snake.

- Prepare several more pages for other snakes of note (especially any snakes that are commonly found near the school).

Common Core Connections

RH.6-8.7. Integrate visual information (e.g., in charts, graphs, photographs, videos, or maps) with other information in print and digital texts.

RI.6.7. Integrate information presented in different media or formats (e.g., visually, quantitatively) as well as in words to develop a coherent understanding of a topic or issue.

W.6.7. Conduct short research projects to answer a question, drawing on several sources and refocusing the inquiry when appropriate.

One of the most interesting aspects of the *Snake Scientist* is the recognition of all the unsolved mysteries about the red-sided garter snake. On page 44, Montgomery lists six mysteries that have yet to be solved.

- This activity guide explores ways to approach several of these mysteries, but not all. Pick another one of these mysteries and predict ways to fit, as Bob Mason describes the process, the puzzle pieces together.

- Write down any other questions or unsolved mysteries that are not listed in the book. Explain why you don't find the answer in the text.

Common Core Connections

CCSS.ELA-Literacy.WHST.6-8.9 Draw evidence from informational texts to support analysis reflection, and research.

CCSS.ELA-Literacy.WHST.6-8.1b Support claim(s) with logical reasoning and relevant, accurate data and evidence that demonstrate an understanding of the topic or text, using credible sources.

CCSS.ELA-Literacy.RI.6.3 Analyze in detail how a key individual, event, or idea is introduced, illustrated, and elaborated in a text (e.g., through examples or anecdotes).

CCSS.ELA-Literacy.RI.6.8 Trace and evaluate the argument and specific claims in a text, distinguishing claims that are supported by reasons and evidence from claims that are not.

Other Websites to Explore

Red-Sided Garter Snake Fact Sheet
www.gov.mb.ca/conservation/wildlife/mbsp/fs/rsgarter.html

Information on the Red-Sided Garter Snake and the Narcisse Snake Dens from Manitoba Provincial Government.

Common Garter Snake
extension.oregonstate.edu/catalog/pdf/ec/ec1602.pdf
(Information on the common garter snake from Oregon State University.)

Identifying Snakes: A How to Guide
www.wildernesscollege.com/identify-snakes.html
(A well-done site on the basic element of snake identification from Alderleaf Wilderness College.)

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KidZone Fact Sheet on Snakes
www.kidzone.ws/lw/snakes/facts.htm
(For younger students, this site provides excellent information on snakes as well as activities, worksheets, puzzles, and word searches.)

Further Reading

Bishop, Nic. *Snakes*. Scholastic, 2012.
Blobaum, Cindy. *Awesome Snake Science: 40 Activities for Learning About Snakes*. Chicago Review Press, 2012.
Mattison, Christopher. *Snake*. Dorling Kindersley, 2006.

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