SCIENTISTS IN THE FIELD

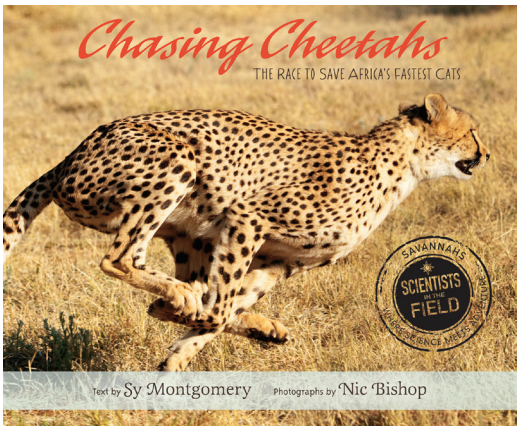
WHERE SCIENCE MEETS ADVENTURE

DISCUSSION AND ACTIVITY GUIDE

Chasing Cheetahs: The Race to Save Africa's Fastest Cats
by Sy Montgomery photographs by Nic Bishop

About the Series

Chasing Cheetahs 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.



Chasing Cheetahs: The Race to Save Africa's Fastest Cats
by Sy Montgomery
photographs by Nic Bishop

About the Book

The wonderful team of the author Sy Montgomery and the photographer Nic Bishop introduce readers to Laurie Marker, founder of the Cheetah Conservation Foundation, and her staff who study cheetahs and work to preserve this unique animal.

About 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, and hunted by a tiger, and she has crawled into 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, a Robert F. Sibert Award, the Henry Bergh Award for Nonfiction, and many more.

Montgomery is an ardent conservationist. 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 he is also the author of more than sixty books 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.

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.

DISCUSSION AND ACTIVITY GUIDE

Chasing Cheetahs: The Race to Save Africa's Fastest Cats

by Sy Montgomery
photographs by Nic Bishop

Pre-Reading Activity

Make a list of every animal that you can think of that is considered to be a pest, with a brief annotation for why this animal is considered to be vermin.

Collect some beetles and ants (carefully—and please return them when finished). Put them on a starting line either in a box or on the classroom floor. Create a finish line and time the beetles and ants as they "race" from start to finish. Who is faster, beetles or ants? Why is this activity so much different than timing runners, racecars, or cheetahs?

Watch this National Geographic video on filming how fast cheetahs run and how National Geographic filmed these animals (if you fast forward to the 12.30 mark of this 19-minute video, you will see amazing footage of just the cheetah running): video.nationalgeographic.com/video/specials/nat-geo-live-specials/wilson-cheetah-lecture-nglive. At a safe distance, try filming cars on a freeway traveling at 70 miles per hour.

Discussion Questions

What benefits are associated with predators? Do they do any harm to the environment?

What is a cheetah? Is it mostly a cat or mostly a dog? Before answering, take a look at the claws and feet of pet dogs and cats.

What are the pros and cons of people coming into close contact with animals such as cheetahs?

Laurie Marker had never even seen a cheetah until she was in her twenties. What animals have you not seen in person that you could imagine working with in your career?

Are there any animals for which you seem to have an affinity? Have you had experience with animals that seem to prefer you more than they do your friends or family? Do you know someone like this? Why do animals seem to prefer one person over another, or why is this claim suspect?

Many scientists frown on the naming of wild animals because they feel it tends to anthropomorphize the animals, which has the effect of reducing the objectivity of the scientist and her ability to observe behavior and draw appropriate conclusions. Yet in this book Dr. Marker begins by introducing a cheetah named Tiger Lily. Dr. Marker has won many awards, including "Hero of the Planet" by *Time* magazine. She is also described in the book as a maverick. Is the conventional warning against naming wild animals totally off base? Why does Dr. Marker walk with cheetahs on a leash and name them? What are the pros and cons to Dr. Marker's approach to working with cheetahs?

Is seeing a cheetah on leash a misrepresentation of the species? Is this an effective way to share these creatures with very young students?

Applying and Extending Our Knowledge

Look back at the pre-reading activity in which students made a list of vermin with a brief description of why the animal is considered to be a pest.

- Analyze the list and sort into genus and species categories. Are any of the pests recorded mammals? Discuss in groups the commonalities of the animals deemed to be undesirable.
- Have students write down all of the biological facts (ranges, size, distinguishing biological features, diet, life span, life cycle, predators, population size, etc.) about these pests that they know without looking them up online or using any reference materials at all.
- Then check reference sources and add to or correct the list of facts as appropriate. Discuss what you notice.
- Think about food chains in reference to this list. What animals would be negatively impacted if we significantly reduced the numbers of these pests?
- Design a promotional piece for one of these pests with the goal of changing attitudes about it. Go into the classroom of younger students and take a poll of the students for animals they think are pests. Tabulate the results and pick the animal with the most votes. Research this animal and then return to the younger classroom and present information that shows the value of this organism. Retake the class poll. Did the information you presented change any minds?

Explain your results to your peers. If you are able to pick three separate classrooms, plan three different strategies for convincing students and evaluate the approach that suggests it may work more effectively. Evaluate the pros and cons of each method.

- Write a persuasive essay from the point of view of the pest, proving the value of keeping it alive.

Common Core Connections

CCSS.ELA-Literacy.W.6.2a Introduce a topic; organize ideas, concepts, and information, using strategies such as definition, classification, comparison/contrast, and cause/effect; include formatting (e.g., headings), graphics (e.g., charts, tables), and multimedia when useful to aiding comprehension.
CCSS.ELA-Literacy.W.6.4 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.6.7 Conduct short research projects to answer a question, drawing on several sources and refocusing the inquiry when appropriate.
CCSS.ELA-Literacy.SL.6.1 Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 6 topics, texts, and issues, building on others' ideas and expressing their own clearly.

- Examine the map of Namibia on page six and compare the size and location of Namibia in Africa to the United States in North America.
- Find out the size of Namibia and transpose it on a map of the United States.
- Research Namibia's climate and then reconfigure and cut and paste the transposition from the preceding activity to reflect the area of the United States that most matches the climate of Namibia.
- Make a case both for and against the possibility of the United States having a habitat that would both support and sustain the introduction of a wild cheetah population. What is the typical set of results when species are introduced into any new habitat? For a zoo to have a successful cheetah habitat, what would it have to provide for cheetahs? Make a chart showing the probabilities of survival and the probability of cheetahs becoming an invasive species, with bullet points defending your analysis. Make sure your prediction takes into consideration the full range of habitat requirements: diet, physical size of habitat, climate, plants, etc.
- Research the former range of cheetahs. Without considering the threat from humans, is any of this former range still suitable habitat for cheetahs? Are there other areas in the world that seem as if they would be a match for cheetahs from an analysis of the physical terrain, the climate, and a potential food source? Now discuss the impact of adding humans into the equation. What could humans do to make life easier for cheetahs?
- What is the current political structure of Namibia? Can you discover corroborating evidence about the range of Namibian acceptance or rejection of cheetahs? Is there any current reliable evidence from the Namibian government about its support of cheetahs, with confirmation by a reliable and objective third party?

Common Core Connections

CCSS.ELA-Literacy.W.6.2a Introduce a topic; organize ideas, concepts, and information, using strategies such as definition, classification, comparison/contrast, and cause/effect; include formatting (e.g., headings), graphics (e.g., charts, tables), and multimedia when useful to aiding comprehension.
CCSS.ELA-Literacy.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.6.9 Compare and contrast one author's presentation of events with that of another (e.g., a memoir written by and a biography on the same person).
CCSS.ELA-Literacy.W.6.9 Draw evidence from literary or informational texts to support analysis, reflection, and research.
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).
CCSS.ELA-Literacy.RST.6-8.8 Distinguish among facts, reasoned judgment based on research findings, and speculation in a text.
CSS.ELA-Literacy.RH.6-8.7 Integrate visual information (e.g., in charts, graphs, photographs, videos, or maps) with other information in print and digital texts.

DISCUSSION AND ACTIVITY GUIDE

Chasing Cheetahs: The Race to Save Africa's Fastest Cats

by Sy Montgomery
photographs by Nic Bishop

Throughout the book we read about the purring and hissing and other catlike noises cheetahs make. We also read about some distinctly doglike features, such as the claws on a cheetah.

- Prepare an online presentation showing how cheetahs fit into the "big cat" picture of tigers, leopards, lions, panthers, and cougars.
- In the presentation, make sure to explain the difference between each of these different cats. Also include information explaining the differences between big cats and pet cats.
- Make a map showing where various types of big cats live.
- Make a set of cards showing the types of big cats, their range, what they eat, threats to the various species, and other interesting facts.
- Prepare a poster or an online presentation distinguishing cheetahs from wolves, Great Danes, and other dogs.
- Prepare a Venn diagram showing what cheetahs have in common with other cats and dogs and how they differ.

Common Core Connections

CCSS.ELA-Literacy.SL.6.5 Include multimedia components (e.g., graphics, images, music, sound) and visual displays in presentations to clarify information.
CCSS.ELA-Literacy.W.6.2a Introduce a topic; organize ideas, concepts, and information, using strategies such as definition, classification, comparison/contrast, and cause/effect; include formatting (e.g., headings), graphics (e.g., charts, tables), and multimedia when useful to aiding comprehension.
CCSS.ELA-Literacy.SL.6.4 Present claims and findings, sequencing ideas logically and using pertinent descriptions, facts, and details to accentuate main ideas or themes; use appropriate eye contact, adequate volume, and clear pronunciation.
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).
CCSS.ELA-Literacy.WHST.6-8.6 Use technology, including the Internet, to produce and publish writing and present the relationships between information and ideas clearly and efficiently.

On page 12 we read, "Saving cheetahs, she's found, demands reexamining long-held beliefs, asking new questions, finding unexpected answers, and turning enemies into friends. 'The problem isn't with predators,' she insists. 'The problem is with us humans. We have to change the way we think and behave.'"

- The typical response from many in the face of a quote like this is to assume that the change required applies more to other people than it does to us. Describe in a piece of writing the steps you could take to change a long-held belief or turn an enemy into a friend. Include an example of how you could apply that to a belief or situation in your own life.
- How do people change long-standing traditions and habits? How would we begin to change the behavior of a state or nation? What steps would we need to take to, say, convince people to stop killing spiders or bats, or to stop killing tigers or sharks? Is there any evidence of steps our country or Namibia has already implemented to change the minds of the average person about the role of a predator like the cheetah? How long would this process take?
- Make a list of the "long-held beliefs" of which Dr. Marker refers. What new questions should we be asking? Make a list of questions that Dr. Marker suggests we should be asking. Predict what you think could be unexpected answers.
- Readers in the United States are a long way from Namibia and may feel no sense of urgency in changing behaviors. It may be easy to suggest changes for the Namibian people and the Namibian government, but what changes in behavior do students in the United States need to adopt to save animals such as cheetahs? List these, too. For all lists, supply a brief annotation that explains each list entry.

Common Core Connections

CCSS.ELA-Literacy.RI.6.1 Cite textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text.
CSS.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.W.6.1 Write arguments to support claims with clear reasons and relevant evidence.
CCSS.ELA-Literacy.W.6.2 Write informative/explanatory texts to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content.

In the "Fast Facts on the Fastest Cats" bulleted list (p. 15), we read, "The cheetah's flexible spine curves up and down as its legs are bunched and extended, give the legs greater reach.

DISCUSSION AND ACTIVITY GUIDE

Chasing Cheetahs: The Race to Save Africa's Fastest Cats

by Sy Montgomery
photographs by Nic Bishop

Like a greyhound's at full stride, when the legs bunch inward, the cheetah's hind legs reach almost past the ears before they fly backwards again."

- Why does having a flexible spine add to the cheetah's speed? Make a model (or a graphic) comparing the spine of a cheetah with the spine of a greyhound or another big cat. Demonstrate what a flexible spine does to increase the speed of the cheetah.
- Compare the heart, liver, arteries, and lung sizes of cheetahs to those organs in greyhounds or other mammals of similar size. Prepare a slide show or demonstration with models that illustrates what each of these adaptations do to increase the speed of a cheetah.
- Look for examples of inventions or technology or products that may have used the cheetah as the model for increasing speed.
- Design a cheetah-inspired vehicle that uses the cheetah's flexible spine, oversize organs, and strong arteries as the basis for your creation. Make sure to document how each of these items adds to the speed.

Common Core Connections

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).
CCSS.ELA-Literacy.WHST.6-8.9 Draw evidence from informational texts to support analysis reflection, and research.
CSS.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 21 we read, "'The way to save cheetahs,' Laurie insists, 'is all about goats and dogs.'"

- Summarize the ways in which this symbiotic relationship works. Then look for other examples in your neighborhood or state in which you see similar patterns of behavior in the animal kingdom. Describe the relationships you see and compare and contrast them to the way that the dogs, goats, and cheetahs interact. What part do humans play in this process? Be sure to explain the reason cheetahs hunt goats in the first place. How much exaggeration is there in the claims about the threat cheetahs pose?
- We also read that a healthy flock of goats is less likely to attract a predator. Explain why the health of a flock matters so much. Imagine goats with average health for the entire flock. Now imagine goats with 85 percent of the herd exceptionally healthy and 10 percent with average health and 5 percent with poor health. Will that 5 percent that is in poor health lure predators, or will it be easier for cheetahs to work with a whole flock that is about the same? Play around with the numbers and then ask questions about this on the websites that work with cheetahs (found in the links to the book and this guide). Predict what would happen to the cheetahs and the cheetah range or population size if farming practices and resources available for farmers (including guard dogs) suddenly produce universally healthy goats throughout the whole country.

Write and perform a skit explaining for young students the relationship among the dogs, goats, and cheetahs.

"For most African farmers, a cheetah is the last thing he wants to see on his property—much less walking up to his door. Before Laurie established her organization in Namibia, 'farmers were killing cheetahs like flies.' Throughout Africa, livestock farmers considered these easily tamed cats bloodthirsty monsters." (p. 11) Later on page 31 we read, "Armas explains that he was one of the first lucky farmers to receive one of CCF's shepherd pups. That female, Mondessa, changed his life, he tells us. He never had to worry about cheetahs anymore."

- How do people change long-standing traditions and habits? How would we begin to change eating habits in this country so that we no longer consume something popular like hamburgers? Make a list of the pros and cons for moving our country from eating, say, turkey for Thanksgiving and replacing it with something else, say, rabbit or something vegetarian. Is comparing people killing cheetahs to eating hamburger or turkey a fair comparison? Debate whether or not there is any truth to this sort of comparison.
- Could you live three weeks without cell phones, social media, Internet, television, radio, or any other communication device? What circumstances would have to be present to force us to even consider that we might need to change

our behavior? [Note: the attempt is to have students discuss ways to see the need to change an accepted, desirable behavior in the first place and then how to change that behavior.]

Common Core Connections
CCSS.ELA-Literacy.SL.6.1 Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 6 topics, texts, and issues, building on others' ideas and expressing their own clearly.
CCSS.ELA-Literacy.SL.6.1a Come to discussions prepared, having read or studied required material; 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.6.1a Introduce claim(s) and organize the reasons and evidence clearly.
CCSS.ELA-Literacy.W.6.3 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.6.4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

Livestock farmers kill cheetahs because cheetahs threaten their livelihood. Early in the book, Dr. Marker gives a gift to the farmer who just killed the mother of her beloved cheetah cubs. She could have had him punished.

- Dr. Marker realizes that saving cheetahs includes a very serious economic component. Discover the cost of the guard dogs and the cost of the goats. Research approximate costs for cheetah-proofing a farm and other costs described in the book for making farms safer and healthier. Determine salaries of the scientists and other employees helping farmers cope with cheetahs. Consider other possible expenses, such as the cost of educational school visits, and build a yearly budget prediction for the expenses of this venture.
- Dr. Marker's cheetahs have a tourism value, and she is able to do paid speaking engagements to raise money. The center also receives donations each year. Now make a budget revenue prediction based on information from either the CCF or from other similar organizations.

Common Core Connections
CCSS.ELA-Literacy.W.6.7 Conduct short research projects to answer a question, drawing on several sources and refocusing the inquiry when appropriate.
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).

In chapter 4 we read, "Farmers have known for years that certain trees attract lots of cheetahs, and for that reason called them 'play trees.'" (p. 36)

- Write and illustrate a speculative children's picture book postulating various theories about why cheetahs are attracted to a play tree.
- Create an interpretive dance or a soundtrack that evokes the feeling of play, keeping in mind that the cheetah has some serious business to conduct with and on these trees.
- Visit an elementary school and share the science behind how fast cheetahs run. Make a list of three simple learning goals for your visit. Stage cheetah races for the students and share your picture books and perform your dances for them. Suggest to their teachers that students draw and write about what they have learned. If letters come to your class from the younger students, examine them to see whether students learned what you wanted them to learn.

Common Core Connections
CCSS.ELA-Literacy.W.6.3 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.6.4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

The chapter that will most certainly challenge students contemplating a career as a field biologist or an animal scientist is the one about cooking with poop!

- Regardless of the organism, much of the work of a scientist involves poop, guano, feces, dung, and so on. It also involves observing the animal regularly through all kinds of weather and conditions. Is there an animal or a habitat worth mak-

Chasing Cheetahs: The Race to Save Africa's Fastest Cats

by Sy Montgomery
photographs by Nic Bishop

ing personal sacrifices? Make a list of all the pros and cons to studying cheetahs.
- In the Discussion Questions, we asked what sacrifices you would be prepared to make for a career that you loved. In groups, discuss what kind of person you think Dr. Marker is.
- Discuss whether or not you could be a cheetah scientist.
- Are cheetahs important enough for a personal sacrifice?

Common Core Connections

CCSS.ELA-Literacy.SL.6.1 Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 6 topics, texts, and issues, building on others' ideas and expressing their own clearly.
CCSS.ELA-Literacy.SL.6.1a Come to discussions prepared, having read or studied required material; 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.6.1a Introduce claim(s) and organize the reasons and evidence clearly.

On page 48 there is a bullet point about the role of predators as small as a spider. Researchers discovered that even the loss of spiders changed the chemistry of the soil.

- Think about spiders in your area that elementary students would be able to watch safely. Develop a toolkit your class could share with younger students that would help them understand the difference between a predator and prey. Help them establish guidelines for regularly and safely observing spiders. Make a template for recording what the students see the spider doing, see in the web, etc. Obviously this activity must be done with the cooperation of the younger students' teacher. It may not have full participation of all class members. Doing this activity may have you examining your own long-held beliefs and changing your own behavior. It may have you working with students who believe that the only good spider is a squashed spider. Keep a reflection journal in which you record your reaction to working with spiders, the reaction of your classmates, and the reaction of the younger students.
- Make a list of all the predators in your area. Make flash cards to share with younger students that include basic biological information (range, diet, life span, etc.).

Common Core Connections

CCSS.ELA-Literacy.W.6.1a Introduce claim(s) and organize the reasons and evidence clearly.
CCSS.ELA-Literacy.W.6.4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

Further Reading

Hansen, Rosanna. *Caring for Cheetahs: My African Adventure.* Boyds Mills, 2007.

MacMillan, Dianne M. *Cheetahs.* Lerner, 2009.

Other Websites to Explore

San Diego Zoo Animals, Cheetah:
animals.sandiegozoo.org/animals/cheetah
Information and photographs of the cheetah from the San Diego Zoo site.

CheetahSpot:
www.cheetahspot.com/index.php
Extensive information on cheetahs, including pages on speed and speed comparisons, and a link to a live video cam of cheetahs at the Richmond Zoo.

Guide created by Ed Spicer, Curriculum Consultant, and Lynn Rutan, retired middle school librarian, now reviewer and blogger at Bookends: the Booklist Youth Blog.