SCIENTISTS IN THE FIELD

Where Science Meets Adventure

DISCUSSION AND ACTIVITY GUIDE

Saving the Tasmanian Devil

BY DOROTHY HINSHAW PATENT

About the Series

Saving the Tasmanian Devil 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.

Saving the Tasmanian Devil
by Dorothy Hinshaw Patent
9780544991484

About the Book

When your name includes the word "devil," it may be fitting that the disease, which has moved you to the Endangered Species List, is called Devil Facial Tumor Disease (DFTD). Patent travels to the University of Washington, Australia, and Tasmania to research the steps multiple scientists around the world are taking to save the Tasmanian devil, a keystone marsupial predator, from this ugly, disfiguring, and lethal disease.

About the Author

Dorothy Hinshaw Patent has always loved nature and the outdoors. After receiving her PhD in zoology from U.C. Berkeley, she decided to share that love by writing for children. She has now written more than 131 books, many of them which have won awards such as an Orbis Pictus Honor, ALA Notables, NSTA-CBC Outstanding Science Trade Book, Washington Post/Children's Book Guild Nonfiction Award, Edward O. Wilson Biodiversity Writing Award and many more. Visit her website: www.dorothyhinshawpatent.com.

Pre-reading Activities

The word "devil" conjures up all sorts of different, sometimes conflicting, impressions. Ask students to imagine meeting someone for the first time and hearing someone behind them whisper that this person is a devil. Brainstorm with your students and compile a collection of different meanings and images of this word. Discuss how our use of words and acceptance of words might interfere (or not) with an objective understanding of, say, Devils Tower in Wyoming, Devils Garden at Arches National Park in Utah, Devil's Lake in Wisconsin, the thorny devil (*Moloch horridus*), and the Tasmanian devil. Does the use of words like "devil" become more or less problematic when paired with a disease like Devil Facial Tumor Disease or with devil's claw (*Harpagophytum procumbens*), a plant used to fight arthritis? What does the word "devil" do to the way we understand things?

EDUCATOR'S GUIDE

Saving the Tasmanian Devil

BY DOROTHY HINSHAW PATENT

Students may enjoy researching the history of the cartoon character Tasmanian Devil, as well as the legal battle Tasmania had with Warner Brothers while trying to use the character to promote tourism. There are many videos online. When we watch these cartoons, what is based on the actual Tasmanian devil and what is fabrication?

Review with students the geography of Australia, including the island of Tasmania. Review the meaning of straits, seas, oceans, bights, etc. Comparing the relative sizes of Tasmania, New South Wales, Queensland, etc. Combine this preview with a more comprehensive geography activity—see below.

Students may be familiar with North America's opossum, the only marsupial found in this continent. Explore with students the variety of mammals in the world. Encourage students to list mammal pairs with the least in common. Afterward, maybe using a Venn diagram, distinguish similarities and differences among marsupials, placental mammals, and monotremes.

DFTD is an out-of-control tumor. Review with students basic cell division. Many websites have accurate information on tumors, benign and cancerous. Watch a video about cancer tumors and be prepared to define metastasis and discuss how tumors normally spread. Spend time exploring the diversity of tumors and cancers. Look at information showing the malignant adaptability of cancer and the way it can morph into new forms, which will relate to the fact that the DFTD discussed in the book currently has two distinct forms.

In relocating vaccinated, healthy devils back into an environment filled with DFTD, scientists took a big risk. Discuss with students when taking a big risk outweighs the very possible negative consequences. What makes the Tasmanian devil worthy of study?

It may be useful to have a discussion about our fears and phobias. Students are frightened by wind, by moths, by ants, by clowns, and all sorts of things that others have trouble understanding. Students who have personal confrontations with cancer may fear death, a prolonged, rehabilitation, or other cancer-induced loss. Establishing a safe environment for discussing our fears, our misunderstandings, and our knowledge is always useful.

Discussion Questions

In this book, scientists make a decision to risk healthy devils in order to test whether or not the vaccine they have been building will be effective. At what point does the potential benefit outweigh the risk? Would your answer be different if we swapped devils with gray whales? What about spiders? Healthy working farm animals? Your own personal pet? People?

Throughout history there have been stories showing how our observations and understandings of animals have been lacking, which has led to some very unfortunate decisions. For example, the horrible decision in Hawaii to introduce the carnivorous mongoose to control the rat population, did nothing to control the rats, but did wreak havoc on the native bird populations. In this book, observations about the spread of DFTD lead researchers to conclude initially that this disease is spread by spats and biting, which may not be completely true. When does our database of observations lead to reliable conclusions and when do they produce useless and even harmful theories? How do we ensure that our analysis of observations produces beneficial practices?

One of the key problems in this book is about doing more than just keeping animals alive. Scientists work to provide animals with a productive life as wild animals. What factors are involved in this consideration?

The beginning of chapter three includes a description of seeing a devil pacing at a zoo. Patent describes this behavior as "obsessive." Other zoos and animal attraction sites have reported similar behaviors from a wide variety of animals. What value do zoos have, especially from the perspective of the caged animals?

Tasmania has an interesting history, with its share of both marvel and despair. Students will find fascinating information about convicts and heartbreaking material about the Aboriginal people of Tasmania. Is there any link between a country's history and the status of any given animal, such as the Tasmanian devil?

Think about a prospective career that you can see yourself doing. This book shows scientists working in all kinds of unpleasant weather. Scientists working with animals are constantly collecting and testing all sorts of bodily excretions. Work locations can include long stretches in a

lab doing testing, as well as being in isolated places in the wild, far from the conveniences of city life. Discuss your observation skills, your stamina, and your persistence. Can you see yourself in a science career?

Many people complain that we underestimate their abilities. What one person sees as a risk, someone else sees as being safe. What is something you do that other people may not understand? If one of the scientists in this book asked you for help, what ability would that scientist be attempting to tap? What traits do you need to develop to advance your skill up to the next level?

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 you willing to sacrifice in order to do a job you enjoy? When does the price of the sacrifice force you to move on to other activities? Now change the terminology from "something you enjoy doing" to "something that must be done." Is there still a point at which the sacrifices are just too much?

There are plenty of online videos showing people who seem to have an intuitive feel for how to attract animals. We also know that attributing human characteristics to animals often brings harm to that animal. Which animals do you think people understand the best? Do some animals seem to enjoy or at least not mind your presence? How do we protect animals when we condition them to rely on humans? Which animals do you think you could study objectively? Is being objective always the most fundamental requirement?

Applying and Extending Our Knowledge

Patent's nonfiction narrative for this book includes regular sidebars with, "What I learned . . ." snippets. This book also uses other types of sidebars, infographics, captioned photography, maps, a glossary, and more.

- Have students create their own notes responding to these typical nonfiction tools. Encourage students to respond to the effectiveness of, say, the photography and how well it conveys the intended message of the text. Or have students make a list of "Three things that surprised me in this chapter." The goal is to have students notice that a sidebar (and other nonfiction features) is supposed to increase our understanding, so encourage a wide variety of responses.
- If this book were a fiction title, what changes would be required? Is there a way to convert this book to a fiction title without changing much of the text? Examine the "What I learned" segments and evaluate these in terms of showing Patent's "character growth." Are there significant changes noticeable from beginning to end? That is, did Patent have to unlearn or revise what she thought she knew? Write a short story incorporating these segments and adding a dramatic element. Try doing this in both first person and third person.
- Patent's first-person writing of a nonfiction book is something that was deemed a mistake not all that long ago for scientific writing. If you were an editor looking for a third-person perspective, suggest the changes Patent would need to make. Find a page and make edits showing her what third person would look and sound like. Write a response detailing what is lost and gained by moving from first person to third person and vice versa. Include in this response why you think nonfiction writing has allowed a personal perspective.
- This book includes a number of specialized vocabulary words and terms. Each time you encounter a term that is foreign to you, write it down. Look for the term in the glossary and rewrite the glossary definition in a way that allows you to remember it.
- Write a poem or story using as many of the terms in the glossary as you are able to fit in. In addition to rewriting the glossary definition in a way that allows you to remember it, also try writing a definition of the term that allows younger students to understand it.

Common Core Connections

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.
CCSS.ELA-Literacy.W.6.1(a-d) Write arguments to support claims with clear reasons and relevant evidence.
CCSS.ELA-Literacy.RI Cite strong and thorough textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text.
CCSS.ELA-Literacy.SL.7.4 Present claims and findings, emphasizing salient points in a focused, coherent manner with pertinent descriptions, facts, details, and examples; use appropriate eye contact, adequate volume, and clear pronunciation.
CCSS.ELA-Literacy.W.6.1(a-d) Write arguments to support claims with clear reasons and relevant evidence.

How big is Australia?

- Create an overlay that superimposes Australia and then Tasmania onto a map of the United States.

- Using a variety of measures, such as climate, physical size, population, culture, biodiversity, economics, etc., prepare various comparisons with your area. Use Venn diagrams or other graphics to visually depict the similarities and differences. How does the environment in Tasmania compare to the other states of Australia? If Tasmania were in the United States, where would it fit most comfortably, if not perfectly? Provide a rationale for your answer.
- Prepare an Animoto video or other visuals that explain to younger students why winter in Tasmania is during what U.S. students think of as summer.

Common Core Connections

CCSS.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.
CCSS.ELA-Literacy.SL.7.5 Include multimedia components and visual displays in presentations to clarify claims and emphasize salient points.
CCSS.ELA-Literacy.SL.7.4 Present claims and findings, emphasizing salient points in a focused, coherent manner with pertinent descriptions, facts, details, and examples; use appropriate eye contact, adequate volume, and clear pronunciation.
CCSS.ELA-Literacy.W.6.1(a-d) Write arguments to support claims with clear reasons and relevant evidence.

Tasmania is smaller than the United States, yet Tasmania has a hundred or more marsupials living on it compared to the single marsupial found in the United States.

- Create a list of marsupials that live in Australia and research which of these live on Tasmania. Divide this list among groups of students and have each group create sets of flashcards that include a photo, scientific name, range, habitat description, diet, status, unusual features/behavior, threats, etc. Note whether this animal has interactions with the Tasmanian devil.
- Prepare a presentation on the devil's habitat in Tasmania. Using some of the information above, compare the devil's habit with the opossum's habitat in the U.S. Speculate on theories for elements of the devil's habitat that would lead to the increased number of marsupials.
- Research the shifting public opinion of the Tasmanian devil. Prepare a presentation that shares this history with young students. Make sure to have a component that informs your audience of what a marsupial is and the difference between marsupials and mammals. If you were creating a playlist that documented our growing understanding (and misunderstandings) of Tasmanian devils, what songs would you include and why?

Common Core Connections

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CCSS.ELA-Literacy.RI 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.
CCSS.ELA-Literacy.SL.7.5 Include multimedia components and visual displays in presentations to clarify claims and findings and emphasize salient points.
CCSS.ELA-Literacy.RI Delineate and evaluate the argument and specific claims in a text, assessing whether the reasoning is valid and the evidence is relevant; identify false statements and fallacious reasoning.

On page 16, we read "biting and threatening to bite are a big part of a Tasmanian devil's life." On page 49 we read, "'Devils don't bite each other that often. They're actually quite docile.'" Sometimes reputations influence the way we are seen.

- What changed from page 16 to page 49? Discuss. Use the text to cite page number evidence supporting your position. What other animals have experienced similar shifts in our scientific understandings?
- The Tasmanian devil joins a list of creatures, including the Virginia opossum, that have public relations problems. Design a campaign that moves the Tasmanian devil (or the opossum) into a more favorable light.
- Bats, snakes, spiders, wolves, and many other critters may wish to speak to the Tasmanian devil about how to deal with misunderstanding. Hold a debate or create a short story or art project that shares how these animals would communicate with the Tasmanian devil.
- Look at the activities above and then look at the devil shown on page 10. Does this affect the way you envision the activities above? Explain.

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clear reasons and relevant evidence.
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CCSS.ELA-Literacy.RI Cite strong and thorough textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text.

Pages 13–15 include several infographics that show chromosome pairs (see also page 61). This section is included to assist readers with understanding how cancerous tumors form and grow. It discusses karyotypes, DNA, cell division and more, which are essential for understanding how DFTD can produce the tumors we see on the Tasmanian devil shown on page 10.

- But what is a chromosome? What is DNA? What jobs in our bodies do they do? Do they work the same way in an animal's body? What is a karyotype? What does cell division really mean? Review these terms and show how they work in a healthy animal and how cancer perverts their normal functions. Prepare an explanation, using infographics, that explains these terms in language that a younger student would understand.
- On page 12 we read: "'You may think I'm crazy,' Jenny said to Anne-Maree, 'but I think you must have a cell clone.'" What is a cell clone? Prepare an online visual explaining what it means, keeping in mind the fact that Jenny thinks this is extremely odd.
- Prepare an online or other visual explanation for the way bacteria and viruses cause cancer. Prepare a Venn diagram (or similar) that compares the differences between cancer caused by a virus or bacteria and by the cell clone that Jenny discusses.
- On page 56 we read, "The DFTD cells don't have these molecules on their surface, so the immune system can't detect them. It's as if they were wearing invisibility cloaks." Prepare an animoto video (or similar) that shows the normal way an immune system would ward of disease. Then show what is meant by these molecules wearing an invisibility cloak.

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Patent explains that her approach to understanding Tasmanian devils and Devil Facial Tumor Disease is to assemble a team of four scientists: a geneticist, an ecologist, a cancer researcher, and student of genomics.

- Explain the function of each of these scientific jobs. What skills are required to become a scientist in these fields? Prepare a diagram that shows the similarities and differences among these areas of studies.
- If Patent were to consider another scientist for this book, what sort of scientist should she choose that would add a new dimension to consider?
- Critique these choices. Using the text and citing page numbers, show how each scientist added to the understanding of Tasmanian devils. How well does this organization work? Review this book's structure and state for whom this book is best suited.
- Jenny Marshall Graves believes that studying obscure animals, such as the Tasmanian devil, "is vital to understanding genetics in general." Speculate on this claim. With the help of your school or town librarian, research why Graves thinks this is vital.
- Greg Woods focused his research on the "immune escape mechanisms of DFTD." With the help of your school or town librarian, research and report on what is meant by immune escape mechanisms.
- Alex Fraik focuses her research on how Tasmanian devils are adapting to DFTD. Is there any research out there that focuses on whether (and how) a disease like DFTD adapts? Keep in mind the section on page 61 in which Woods notes that there are at least two types of facial tumors affecting Tasmanian devils.

Common Core Connections

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Patent's final chapter is entitled "Looking to the Future" and she leaves readers with her belief that the Tasmanian devil will survive the DFTD crisis. This book is published in 2019 and the research included is from even earlier.

- Patent cites the Save the Tasmanian Devil website in her Internet Resources in the back matter. Check this site to see the most current information about the Tasmanian devils. There are also additional sources available on Tasmanian devils. Do any of these sources have information that confirms or casts doubt on Patent's prognosis? Update your classmates with the results of your searches.
- Do an overall "What I learned" in the same style as Patent's sidebars throughout this book. Post a review of this book on any of the online review sources and in your own library.

Common Core Connections

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Further Reading

In addition to the book listed on page 76, these may also be useful:

Farrell Chris, and Peter Rowland. A Naturalist's Guide to the Mammals of Australia. Naturalists' Guides series. Oxford: John Beaufoy Publishing, 2018.

Menkhorst, Peter, and Frank Knight. A Field Guide to the Mammals of Australia. Oxford: Oxford University Press, 2011.

Other Websites to Explore

In addition to the Save the Tasmanian Devil website listed on page 76 (www.tassiedevil.com.au/tasdevil.nsf), these additional sites may be useful:

National Geographic has some basic information and some interesting videos: www.nationalgeographic.com/animals/mammals/t/tasmanian-devil

Australian Wildlife has useful, linked information about marsupials in Australia: www.australianwildlife.com.au/marsupials.html

Learn About Wildlife makes money selling tours, but the information about the three types of mammals is presented well: www.learnaboutwildlife.com/wildlifeAustraliaMammals.html

PBS has short videos on how cancer cells grow and divide, how cancer grows, etc.: wgvu.pbslearningmedia.org/resource/tdc02.sci.life.stru.oncogene/how-cancer-cells-grow-and-divide

Guide created by Ed Spicer, curriculum consultant, retired educator, and blogger at spicyreads.org. Follow him @spicyreads on Twitter or email at edspicer@mac.com.