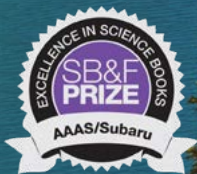


BEAUTY AND THE BEAK

by Deborah Lee Rose
and Jane Veltkamp

EDUCATIONAL GUIDE



AAAS/Subaru SB&F Prize
for Excellence in Science Books Winner



Bank Street College Cook Prize
for Best STEM Picture Book



Eureka! Gold Award
for Nonfiction



A Junior Library
Guild selection

**HOW SCIENCE, TECHNOLOGY, AND A 3D-PRINTED BEAK
RESCUED A BALD EAGLE**

BEAUTY AND THE BEAK

HOW SCIENCE, TECHNOLOGY, AND A 3D-PRINTED BEAK RESCUED A BALD EAGLE

By Deborah Lee Rose and Jane Veltkamp



With special content from The **Cornell** Lab of Ornithology

This breathtaking, nonfiction picture book tells the full story of Beauty, the bald eagle that was shot, rescued and received a pioneering, 3D-printed prosthetic beak. Beauty has been featured on Nat Geo WILD around the world and in news stories worldwide. BEAUTY AND THE BEAK follows Beauty close up from the moment she uses her baby beak to emerge from her egg, through her hunt when she uses her powerful adult beak to feed herself, to the day her beak is shot off leaving her helpless. This true, heartlifting story continues through her rescue, into months of engineering her prosthetic beak and intense hours of surgery, to the moment she takes the first drink of water by herself with her new beak.

BEAUTY AND THE BEAK captures the spirit and courage of this amazing bird and America's national symbol—whose species was endangered by human activity, only to be restored and thriving because of environmental conservation and human compassion. This book will resonate with stories of other animals endangered or in need, and with stories of humans, from young children to military veterans, in need of prosthetic limbs, who are being given new lives with state-of-the-art devices. *Book and guide cover photo by Glen Hush, © Jane Veltkamp.*

Deborah Lee Rose and Jane Veltkamp present in person, and via Skype and other platforms, to schools, libraries, events and conferences. Jane presents with live raptors in Idaho and nearby states. Contact them via deborahleerose.com and birdsofpreynorthwest.org

EXAMINE AND 3D PRINT BEAUTY'S PROSTHETIC BEAK

Purchase a 3D-printed, lifesize replica of Beauty's beak, and/or the STL file to 3D print a replica, at www.birdsofpreynorthwest.org

SEE BEAUTY THE EAGLE ON VIDEO

<http://www.birdsofpreynorthwest.org/beauty-and-the-beak.html>

ENGINEER A MODEL OF BEAUTY'S BEAK

Design, make and test simple, hands-on models of Beauty's prosthetic beak. <http://www.eie.org/engineering-everywhere/curriculum-units/prosthetics>

DOWNLOAD AND COLOR A BALD EAGLE

Download at bit.ly/baldeaglecoloring, courtesy of the Cornell Lab Publishing Group and Cornell Lab of Ornithology.

DOWNLOAD FREE BEFORE/AFTER PHOTOS OF BEAUTY THE EAGLE

Download public domain photos from the U.S. Fish and Wildlife Service National Digital Library. <https://digitalmedia.fws.gov/digital/collection/natdiglib/id/17938/rec/1>

KEY WORDS

beak
adaptation
predator
prey

Bald Eagle
raptor
endangered species
symbol

prosthetic
3D printer
biologist
engineer

wildlife
ecosystem
environment
conservation

READ BEAUTY AND THE BEAK

- Where was Beauty born and what time of year?
- How does a Bald Eagle use its beak to survive?
- What do Bald Eagles eat?
- What happened after Beauty's beak was shot?
- What idea did Janie have to help Beauty?
- How did Nate use a 3D printer to help Beauty?
- Who worked on the team to engineer Beauty's new beak? What jobs did they do?
- Why did surgery to attach the beak take so long?
- How did Janie know the 3D-printed beak worked?
- Does Beauty still have her prosthetic beak?
- Can Beauty ever go back to the wild?



Photo © Jane Veltkamp, from the book BEAUTY AND THE BEAK

READ.ANSWER.DISCOVER

1. Bald Eagles are raptors or birds of prey. What *adaptations* make Bald Eagles and other raptors such powerful hunters?

2. By the time they're six weeks old, Bald Eagles have a full adult wingspan—sometimes more than 6 feet (2 meters) wide!

Get someone to measure your armspan. How do you measure up to a Bald Eagle?

3. Janie Veltkamp, who led Beauty's beak team and takes care of Beauty, is a raptor biologist. Handling raptors takes special training, equipment and even clothing. What does Janie wear when she works with Beauty? Why?

Learn more about Janie's work at www.birdsofpreynorthwest.org

4. Why did Janie need an engineering team? What jobs do the team members do in everyday life? How did they work together?

On your own or as a team, you can design, make and test models of Beauty's damaged and prosthetic beaks with special STEM engineering activities from Museum of Science, Boston.

<https://eie.org/engineering-everywhere/curriculum-units/prosthetics>

5. Beauty can never go back into the wild because she depends totally on human help. What help must Janie give her?

6. Choose a photo from the book, BEAUTY AND THE BEAK. Write your own story, poem, essay or song about it, or make a video. What did you learn from this photo? Search the U. S. Fish and Wildlife Service National Digital Library for more Bald Eagle photos.

<http://digitalmedia.fws.gov/cdm/search/collection/natdiglib/searchterm/bald%20eagle>



Photo © Jane Veltkamp, from the book BEAUTY AND THE BEAK

READ.ANSWER.DISCOVER

- 7.** Visit a place or event to see a wild eagle or an eagle being cared for by people. Invite someone who works with eagles or raptors to visit your school or site. Ask them about their work: What's the hardest/coolest thing in your job? How do you get an eagle or raptor to trust you? How do you help raptors return to the wild?

Learn about Janie's work as a raptor biologist, through a Skype visit with her. Contact Janie via birdsofpreynorthwest.org

- 8.** In the past, Bald Eagles were endangered because they were illegally shot, poisoned by pesticides, and human activity reduced the size and quality of their habitat. How can you help conserve wild Bald Eagles and other species for the future?

*Learn more about conservation from the Cornell Lab of Ornithology.
<http://www.birds.cornell.edu/page.aspx?pid=1666>*

- 9.** Where do scientists and engineers get ideas for new things, like Beauty's beak? Do you have an idea for something new? Where did you get the idea?

- 10.** More and more animals and humans are getting prosthetic devices thanks to 3D printing. Some parts, such as artificial hands for children, are being engineered by students, teachers and family members as well as scientists and engineers.

If you were designing and making a new kind of prosthetic body part, what would it be? Who would use it? How would it work? Draw or make a model or video of your idea — or 3D print it. Show or describe how it works to your teacher, classmates, family and friends.

STEM CAREERS AND BEAUTY'S BEAK

The team that created Beauty's beak, this book, and educational materials about Beauty work in STEM and STEM related career fields. Their jobs include RAPTOR BIOLOGIST, ENGINEER, DENTIST, VETERINARIAN, SCIENCE WRITER/AUTHOR, WILDLIFE PHOTOGRAPHER, ORNITHOLOGIST, DESIGNER, PUBLISHER, STEM EDUCATOR, 3D PRINTING TECHNOLOGY EXPERT, and LIBRARIAN.

Which of these STEM careers might you want to work in? Research and/or talk to someone in that career to learn about what they do.

CLOSE READING OF BEAUTY AND THE BEAK

Lori Oczkus, literacy consultant and author

Using animal books like BEAUTY AND THE BEAK in the classroom takes advantage of children's natural curiosity—and students actually enjoy reading informational text. Close reading is an instructional strategy that involves choosing a rigorous text portion to reread a number of times, for purposes such as asking questions, summarizing, searching for text evidence, gleaning information from text features like captions or headings, or analyzing the author's tone, intent and impact of using specific words and phrases.

BEAUTY AND THE BEAK

Bald Eagle Beak Ripping Force STEM Activity

By Deborah Lee Rose and Jane Veltkamp



USFWS photo of a wild Bald Eagle using its beak to rip food from its prey

Bird beaks are adapted for many ways of eating—like ripping pieces of food from prey, pecking for insects, cracking seeds, sipping nectar, or scooping fish. This activity explores how a Bald Eagle uses its sharp, curved beak and other parts of its body to powerfully rip pieces of food from its prey.

BEFORE THE ACTIVITY

If possible, have learners watch a video of a wild Bald Eagle ripping food with its beak, such as this video from the Cornell Lab of Ornithology Bird Academy.

[Academy.allaboutbirds.org/bald-eagles-and-crows-eat-fish-on-an-alaska-beach/](https://academy.allaboutbirds.org/bald-eagles-and-crows-eat-fish-on-an-alaska-beach/)

WHAT YOU NEED

- 3" X 4" (or larger) rectangle of thick brown paper for each learner (thickness of a brown paper grocery store bag)
- Penny or other coin

WHAT TO DO

1. Hold one short edge of the paper rectangle tightly with one hand. Have the thumb above the paper and the other fingers below.

This replicates the Bald Eagle's talons holding its prey.

2. Hold the opposite short edge of the paper rectangle tightly with the other hand. Again, have the thumb above the paper and the other fingers below.

This replicates the Bald Eagle's clenched beak.

3. Try to rip the paper by pulling the hands in opposite directions.

WHAT HAPPENS?

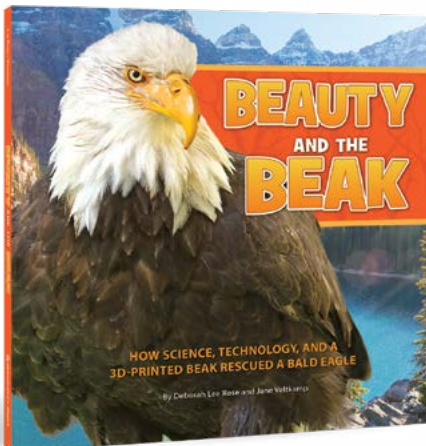
4. Again holding the paper the same way, this time put a coin between one thumb and the paper. (Either thumb is fine.) Make sure the edge of the coin is right at the edge of the thumb. Squeeze the fingers of both hands for a tight grip.
5. Now bend the knuckle of the thumb holding the coin, so the thumb curves like a Bald Eagle's beak. With the thumb curved, dig the edge of the coin into the paper, then make a strong yanking motion up, down, and/or sideward.

This replicates the Bald Eagle's pointed, clenched beak, neck muscles, and talons creating opposing forces to rip off pieces of food.

WHAT HAPPENS NOW?

FOOD FOR THOUGHT

How is the ripping action of a Bald Eagle's beak different than the feeding actions of other birds?



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 PERSNICKETY PRESS

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LEARN MORE ABOUT BALD EAGLES

Bald Eagle CONSERVATION

Rachel Carson (www.fws.gov/rachelcarson) was an environmentalist who wrote the famous book *Silent Spring*. Her work helped convince the U.S. government to stop the use of DDT, a pesticide that was killing Bald Eagles by weakening their eggshells. *Write a letter or give a talk, as if you were Rachel Carson, about protecting and helping Bald Eagles.*

The number of wild Bald Eagles is going up. Scientists helped keep the species from becoming extinct by carefully moving many baby Bald Eagles to different parts of the U.S. mainland. Babies from regions with lots of Bald Eagles were reintroduced to regions with few Bald Eagles. Those baby eagles, once grown to adults, would end up raising their own families in their new locations. *Imagine you're a scientist raising a baby eagle in the wild, after it's been moved. What would the baby eagle need from you to survive? What steps would you take so the baby eagle can grow up wild and not dependent on humans?*

As Bald Eagle populations recover, they need more wild habitat to live safely and thrive. U.S. Fish and Wildlife Service protects Bald Eagles, but they still get hurt or killed when they collide with power lines, cars or trains. The greatest threat to Bald Eagles, that can be prevented, is that they are seriously injured or killed when they are illegally shot. They will die of lead poisoning if they eat prey that was shot with a lead bullet. If Bald Eagle populations start going down, scientists will know something in the environment is harming them and could harm other species too. This is why Bald Eagles are a critical bioindicator species. *Read or write a news story about human impact on Bald Eagles.*

Bald Eagle SYMBOLS

Since June 20, 1782, the Bald Eagle has been part of the Great Seal of the U.S. Bald Eagle symbols are found many places, like on money and in ads. *Find three Bald Eagle symbols. What do they mean? Bald Eagles are a major symbol in Native American culture and traditions, art and legends. Create your own art including a Bald Eagle symbol, perhaps in a model totem pole, a mask, a mural or a video.*

WATCH AND CELEBRATE Bald Eagles

Watch Bald Eagles in the wild, at a zoo, raptor center, wildlife center or eagle festival, or online via live eagle cam. Celebrate Bald Eagles anytime including: Mid-March: National Wildlife Week | April 22nd: Earth Day | Second Saturday in May (U.S.): International Migratory Bird Day | June 20th: "National Bald Eagle Day"—many states celebrate the anniversary of the Bald Eagle first appearing as the national symbol on the Great Seal of the U.S. (1782) | June 28th: Anniversary of announcement that Bald Eagles would be taken off the Endangered and Threatened Species List (2007) | July 4th: U.S. Independence Day.

Bald Eagle RESOURCES

- Cornell Lab of Ornithology: https://www.allaboutbirds.org/guide/Bald_Eagle/id
- U.S. Fish and Wildlife Service: <https://www.fws.gov/midwest/eagle/recovery/index.html>
- U.S. Fish and Wildlife Service Digital Library images: <https://digitalmedia.fws.gov/digital/>
- National Wildlife Federation: <https://www.nwf.org/wildlife/wildlife-library/birds/bald-eagle.aspx>
- Audubon: <http://www.audubon.org/field-guide/bird/bald-eagle>



USFWS photo

STANDARDS

COMMON CORE STANDARDS/English Language Arts Standards

READING/LITERATURE

Grade 3 – Explain how specific aspects of a text’s illustrations contribute to what is conveyed by words in a story.

Grade 4 – Refer to details and examples in a text when explaining what the text says explicitly and when drawing inferences from the text.

Grade 5 – Determine the meaning of words and phrases as used in a text, including metaphors and similes.

READING/INFORMATIONAL TEXT

Grade 3 – Describe the relationship between a series of historical events, scientific ideas or concepts, or steps in technical procedures in a text, using language that pertains to time, sequence, and cause/effect. Use information gained from illustrations (e.g., maps, photographs) and the words in a text to demonstrate understanding of the text (e.g., where, when, why, and how key events occur).

Grade 4 – Explain events, procedures, ideas, or concepts in a historical, scientific, or technical text, including what happened and why, based on specific information in the text. Interpret information presented visually, orally, or quantitatively (e.g., in charts, graphs, diagrams, time lines, animations, or interactive elements on Web pages) and explain how the information contributes to an understanding of the text in which it appears.

Grade 5 – Explain the relationships or interactions between two or more individuals, events, ideas, or concepts in a historical, scientific, or technical text based on specific information in the text. Explain how an author uses reasons and evidence to support particular points in a text, identifying which reasons and evidence support which point(s).

Grade 6 – Analyze in detail how a key individual, event, or idea is introduced, illustrated, and elaborated in a text (e.g., through examples or anecdotes). Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings.

WRITING/RESEARCH

Grade 3 – Conduct short research projects that build knowledge about a topic.

Grade 4 – Conduct short research projects that build knowledge through investigation of different aspects of a topic. Draw evidence from literary or informational texts to support analysis, reflection, and research.

Grade 5 – Conduct short research projects using several sources to build knowledge by investigating different aspects of a topic. Draw evidence from literary or informational texts to support analysis, reflection, and research.

Grade 6 – Conduct short research projects to answer a question, drawing on several sources and refocusing the inquiry when appropriate.

CALIFORNIA SCIENCE STANDARDS - LIFE SCIENCE GRADE 3

Adaptations in physical structure or behavior may improve an organism’s chance for survival. Students know plants and animals have structures that serve different functions in growth, survival and reproduction.

CALIFORNIA SOCIAL SCIENCE STANDARDS - GRADE 3

Know the histories of important local and national landmarks, symbols, and essential documents that create a sense of community among citizens and exemplify cherished ideals (e.g., the U.S. flag, the **Bald Eagle**).

NEXT GENERATION SCIENCE STANDARDS (NGSS)

CROSSCUTTING CONCEPTS: Influence of Science, Engineering and Technology on Society and the Natural World

People’s needs and wants change over time, as do their demands for new and improved technologies. Engineers improve existing technologies or develop new ones to increase their benefits, decrease known risks, and meet societal demands.

DISCIPLINARY CORE IDEAS: Defining and Delimiting Engineering Problems

Possible solutions to a problem are limited by available materials and resources (constraints). The success of a designed solution is determined by considering the desired features of a solution (criteria). Different proposals for solutions can be compared on the basis of how well each one meets the specified criteria for success or how well each takes the constraints into account.

SCIENCE AND ENGINEERING PRACTICES: Engineering Design

Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost. Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.

BEAUTY AND THE BEAK



U.S. Fish and Wildlife Service photo



AAAS/Subaru SB&F Prize
for Excellence in Science
Books Winner



**Bank Street College
Cook Prize**
for Best STEM Picture Book



Eureka! Gold Award
for Nonfiction



**A Junior Library
Guild selection**

**California Reading Association CALIFORNIA READS Recommended Title, California Teachers Association
Chicago Public Library Best of the Best Books for Kids**

Beauty's story made world news and has been featured in Nat Geo WILD TV's "Unlikely Animal Friends" aired in 130 countries, *Science Magazine*, the National Wildlife Federation's *Ranger Rick* children's magazine, as a Green STEM Resource on the NWF Eco Schools website, and on the National Academy of Engineering's EngineerGirl website.

- ALA Booklist: "...the science and technology included in this book are supremely interesting...the compassion and dedication of the people who put it to use to save this wonderful bird are the best part of the story."
- School Library Journal: "Outstanding full-page photographs accompany this uplifting account. Many resources for further study and additional information on the life cycle of eagles, their habitats, and their near extinction and recovery are appended. **Highly valuable for elementary schoolers as a lesson in empathy; an inspiring addition to STEM collections.**"
- Kirkus: "Offer this heartwarming example of animal rehabilitation to fans of *Winter's Tail*...Solid information about bald eagles in the wild is woven into the story...Resources include web connections and QR codes to be used with a Cornell Lab of Ornithology app."

AUTHORS

Deborah Lee Rose is an internationally published, award-winning author of 15 children's books including *Jimmy the Joey: The True Story of an Amazing Koala Rescue*, *Reading is Fundamental/Macy's Multicultural Collection* and *Notable Social Studies Trade Book for Students K-12*, and *Into the A, B, Sea* (a quarter million copies sold). She directed communications for the NSF-funded, ALA/AASL award-winning STEM education website *Howtosmile.org*, and was senior science writer for UC Berkeley's renowned Lawrence Hall of Science. She served as Director of Communications for Lindsay Wildlife Experience, which includes the first wildlife rehabilitation hospital established in the U.S. She lives in Walnut Creek, CA. Visit her website at deborahleerose.com

Jane Veltkamp is a raptor biologist and rehabilitator, wildlife educator, trained nurse, and master falconer. She led the team who developed *Beauty the Bald Eagle's* prosthetic beak. She is founder and executive director of *Birds of Prey Northwest* in Idaho, a nonprofit raptor center which educates the public about raptor conservation, and which has provided medical treatment and rehabilitation to thousands of injured birds of prey to return them to the wild. She spent ten years reintroducing ospreys and peregrine falcons to regions where they had disappeared. Through sponsorship from Idaho STEM Action Center, she is expanding conservation education outreach through live raptor programs. Visit her website at birdsofpreynorthwest.org