

years studying its wildlife. We learn how disease, species interactions like competition and predation, environmental changes, and even animal size plays a role in the history of the Serengeti and why it still exists today. All of the examples of regulation at different levels mentioned in previous chapters are reinforced. Carroll reveals the four remaining Serengeti Rules and reminds us that these rules apply to all systems, from the molecular to the ecosystem level. He also emphasizes that these rules apply to all levels and we must find a way to fix the bad things that happen to our planet when those rules are broken.

It's called cancer, but it's a different kind of cancer. The remaining chapters chronicle the many ways that human activity has caused this. Carroll shares many examples, including toxic algae blooms in lakes and other bodies of water due to pollution, deforestation for food production, proliferation of harmful insects due to using pesticides, and fish population crashes caused by overfishing. Then he asks what rules of regulation have been broken and by whom. He asks if we can use our understanding of these rules to fix any of these problems.

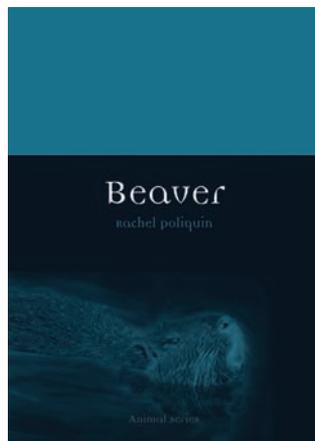
Carroll does offer some ways that humans have made positive changes that restore the rules of regulation in the last 2 chapters. These include the reintroduction of wolves in Yellowstone National Park and improving water quality of lakes in the Midwest in order to restock popular fish species. Then we travel to Africa, to the Gorongosa National Park in Mozambique and learn how it is making a comeback after a prolonged civil war through the efforts of many people, especially Greg Carr and the Gorongosa Restoration Project. What is very cool about this project is that it's working and that the needs of the people living near the park are being considered in the process with jobs and other sources of revenue.

Sean Carroll does a consummate job of coming full circle at the end of the book. I love that fact that he includes some of the lyrics from Led Zeppelin's *Stairway to Heaven* on the first page of the Afterword. This book offers hope that we can make a difference, that we can follow those rules, and that things can get better on our planet, our home. It is well written, meticulously researched, and easy to read. I also learned more about the serendipitous nature of scientific discovery. I thoroughly enjoyed this book and highly recommend it to both teachers and students.



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ANIMALS



Beaver. By Rachel Poliquin. 2015. Reaktion Books. (ISBN 9781780234236). 224 pp. Paperback. \$19.95.



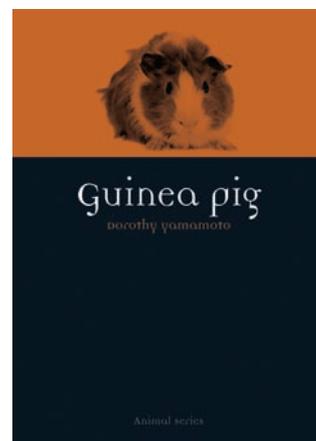
Eagle. By Janine Rogers. 2015. Reaktion Books. (ISBN 9781780233376). 189 pp. \$19.95.



Flamingo. By Caitlin R. Kight. 2015. Reaktion Books. (ISBN 9781780234250). 175 pp. \$19.95.



Goat. By Joy Hinson. 2015. Reaktion Books. (ISBN 9781780233383). 173 pp. \$19.95.



Guinea Pig. By Dorothy Yamamoto. 2014. Reaktion Books. (ISBN 9781780234267). 183 pp. \$19.95.

These five books are part of a series devoted to the natural history of each animal and the animal's impact on human history, primarily as reflected in various aspects of human culture. Reviews of three other books in this series were published in the November–December 2015 issue of *ABT* (vol. 77, pp. 713–714). Here, I give a short, general introduction to the series and then separate reviews of each of the books listed above, which are followed by Cate Hibbit's reviews of three more books in the series.

As with the previous books, the greater portion of each is devoted to the role the animal has played in the arts, literature, and religion. As a biology teacher, you may want to use this series to involve students who are not enthusiastic about biology but who have an interest in history and/or the arts and literature. And there are many quirky nuggets of information that you may want to incorporate in your teaching about ecology, conservation, genetics, and the process of classifying organisms.

This series currently includes 76 books. The animals studied include not only mammals but also insects, such as the ant and bee; mollusks, such as octopus and oyster; reptiles, such as crocodile and tortoise; and birds, such as albatross and peacock. Most of the authors are not professional biologists but rather specialists in literature or cultural studies. This provides a very different approach to the natural history and biology of these animals. At the end of each well-referenced text is a “Timeline” representing what is known about the animal and changes in the human response to the animal. A “Select Bibliography” at the end of each book provides a list of additional resources, including sources of biological information. Before each index is a list of “Associations and Websites.” These are helpful for students looking for additional information about the particular animal.

Beaver. What phrases come to mind when you think of the word *beaver*? The author, Rachel Poliquin, a curator of natural history exhibits, writes that “the beaver has been synonymous with its testicles, musk, asceticism, fur, architectural prowess, collectivism, industry, animal instinct, environmental engineering” She describes the latest variation as occurring in the phrase “beaver believers,” who have “faith in the animals’ ability to re-establish themselves in their native habitats. Rather ‘beaver’ is shorthand for the ecological transformation beavers accomplish by simply living their lives.” This book is worth reading just from that perspective.

The beaver is a “wetlands specialist.” Through their day-to-day living they create areas that can store water. On pages 178–183, the author describes the doctoral work of Glynnis Hood, who examined precipitation records and the area covered by open water in Canadian prairies. In comparing the precipitation of two dry years, Hood found that even though one year, 1950, had 47% more rainfall, it had 61% less open water than the other year, 2002. Looking for a reason, Hood found that the difference was the flourishing beaver population in 2002 compared to 1950. The author asks, would the dust bowl of the 1930s have occurred if the population of beavers had not been decimated through the draining of wetlands as settlers moved west? One of the most powerful statements in the book reflects this new perspective on beavers: “Coexistence is possible, and allowing beavers to take an active role in wetland management may be beneficial not just for humans and beavers, but for the health of the planet.”

The discussion of the biology of the beaver includes unique characteristics of these animals.

There are two beaver species: the North American beaver (*Castor canadensis*) with 40 chromosomes and the Eurasian beaver (*C. fiber*) with 48 chromosomes. The unique characteristics of the beaver lend themselves to some of the attributes we give to the word *beaver*: no animal has a tail like the beaver’s, they have castor sacs, their fur has microscopic barbs, and they have engineering skills. The author gives many pages to the role of the castor sacs in mythology and in medical practice. From the biologist’s point of view, the relationship of toxins from plants and the production of castoreum by the beaver for protection provides a good example of relationships within an ecosystem. The unique fur barbs, through the process of felting, produce a fabric that is waterproof and holds its shape. The bicorne hat of Napoleon Bonaparte was of course made of beaver felt. The chapter on engineering is remarkable in the drawings and explanation of their dam-building ability. The historical background of the rise and fall of the beaver on both continents is also an interesting discussion of the interaction of humans and the beaver.

Before concluding this review, I need to address those of you who thought of the word *beaver* for what the author calls “the beaver down below.” There is a nine-page description of the derivation of the slang term. My caution to middle and high school teachers: if you ask a student to read this book, be prepared to respond to student and parent reaction.

Although the mythology section seems labored to this reviewer, this book is a captivating read. The ecology chapter provides support for the author’s championing of the beaver as our “wetlands specialist.”



Eagle. The author of this book, Janine Rogers, a professor of Medieval and Renaissance Literature, explains that the eagle, as a symbol and in its environment, is an organism of contradictions. Eagles kill prey but also eat decaying flesh. On the other hand, eagles are long-lived, are loyal to their mates, and care for their offspring. With these opposing ideas in mind, the author describes the biological, mythological, and symbolic roles of the “King of the Birds.”

In describing the biology of eagles, the author points out that the term “eagle” is used to describe a category of raptors that are carnivorous, diurnal, and large compared to other flying birds. Teachers can use the discussion of the problems of classification as a different example of how scientists determine species and relationships among organisms. The thirteen species of hawk-eagles can serve as

an example of convergent evolution. Eagles are found on every continent except Antarctica, but North America is home to only the golden and bald eagles.

The eagle has phenomenal strength. Its feet are its most dangerous part. The ability to grab prey is provided by three talons facing forward and one facing backward, producing a grip that has been estimated as 200 pounds per square inch. The “eagle-eye” is different from human eyes. They have more receptors in the retina and see near ultraviolet. The description of their eyes is a good way to integrate the physics and chemistry of sight. Focusing on hearing, dietary habits, weight, and behavior, the author further develops the characteristics of the eagle’s body. From piracy to hunting and migration to flight patterns, eagles offer a variety of examples of behavioral adaptations.

The author relates these characteristics to the myths and symbols in which the eagle has a role. Most religions include eagle symbols. Cultures from Siberia to the Pacific islands have myths in which the eagle is portrayed, often in association with snakes or crows. The eagle head and lion body of the gryphon found in Mesopotamian seals was associated with protecting treasures. The gryphon became the symbol of Christ as a protector, with the heavens represented by the eagle and the earth represented by the lion body. The hippogriff, part eagle and part horse, is featured in the *Harry Potter* books as Buckbeak.

Chapter 3, entitled “Patriotic Eagle: Flags, Heraldry, and Emblems,” has a wealth of examples of how the eagle’s behavior and folklore have led to prominent places in flags, coins, and art. A major section of this chapter describes the placement of the eagle in the art, symbols, and culture of the United States. To mention a few: Apollo 11 and the first men on the moon (“The Eagle has landed”); the presidential seal; Swoop, the official mascot of the Philadelphia Eagles football team; and the Muppets’ Sam the Eagle. The place of the eagle in Native American culture is shown in interesting images and the derivation of this cultural inclusion is explained. The author points out that the incorporation of the eagle into culture gives it “an advantage over other endangered birds.” For example, bald eagles were removed from the Endangered Species List in 2007.

Toward the end of the book, there is a discussion of the threats to eagle populations and the organizations that are working to protect these valuable birds. The images in the book are beautiful, and many are in full color. Although the majority of the text is focused on the cultural aspects of

the eagle, there is much information that biology educators can use directly or encourage their students to read. For the nonbiologist, it is a good way to learn some biology.



Flamingo. Two questions that come to mind when thinking about the flamingo are “What is the source of the flamingo’s color?” and “Why do flamingos stand on one leg?”

The author, Caitlin R. Kight, whose postdoctoral research was in ecology and conservation, presents both answers and hypotheses for these questions. Yes, some flamingos owe their color to brine shrimp, but the primary sources of the color are the carotenoids derived from the cyanobacteria, algae, and phytoplankton they eat. The brightest color is found among the American flamingos. Color plays a role in mating: flamingos with a brighter color mate before those with lesser color. Several pages in the book are devoted to coloration and are a worthwhile read from both a chemical and a behavioral perspective. The color question provides the teacher with a nice example to show how molecules in a food source affect the predator.

A debate arose about the reasons for the one-legged stance. One explanation is that this behavior limits muscle fatigue. The other is that the behavior helps to retain heat. You have probably guessed that the data support the idea of heat retention as the advantage to the flamingo. This provides another approach to engaging students, by showing how scientists argue over various explanations for animal behavior and how good research leads to further questions. In this case, the method used to determine the best explanation led to additional research about other flamingo behaviors.

To place the flamingo in time and location, the author reviews fossil evidence that suggests that flamingos have existed for more than 100 million years. These easily recognizable birds are found on five continents and include six species, as determined by genetic analysis. The grebe appears to be the flamingo’s closest relative. At the end of Chapter 1 there are several maps to indicate the range of the various species of flamingos. The maps help in understanding how the flamingo is endangered in some places and thriving in others.

The author shares the derivation of the word *flamingo* from the Latin word for “flame” (*flamma*); in Portuguese the bird is called *flamengo*, and in Spanish *flamenco* (no relationship to the dance); and adding the Germanic *ing* produced the

English word *flamingo*. What a great example of the relationships among languages!

Never having paid attention to the flamingo’s bill, I was fascinated by the description, diagrams, and photographs of the shallow-keeled and deep-keeled bills. This information could be used as an example of morphological adaptations that bring success to the species. The last chapter, entitled “The Future of Flamingos,” discusses in more depth the relationship of the flamingo and its habitat conditions.

The book is balanced between the biological and cultural aspects of the flamingo. The cultural relationships are addressed in the chapters entitled “Flamingos in the Early Human Consciousness,” “The Rise of the Modern Flamingo,” and “A Breed Apart: Pink Plastic Flamingos.” These chapters are filled with delightful images of the flamingo showing how they have been represented through time. The chapter on the pink plastic flamingos, *Phoenicopterus ruber plasticus* (yes, this is in the book), reminds the reader of how animals become symbols of culture – though for some “merely a humble ornament, others have found a deeper meaning” After you have shared some of the information from these chapters with your students, challenge them to find multiple images of other animals in current culture.

There are beautiful images throughout the book. The text is an easy read with a nice touch of humor. The book could serve as a way to encourage the reluctant biology student to learn about how scientists use a variety of approaches to learn about the natural world. As the author states in her concluding paragraph, “Flamingos have always caught our attention and have never failed to impress.”



Goat. Goats and humans have a long and varied history together. The author, Joy Hinson, an endocrinologist by training, begins the book with a look at the relationship between goats and humans. From reflections in early artworks to the derivation of the name, the author shows how this relationship is both positive and negative, even to the use of the word *goat* in our language. For example, a “scapegoat” is the person who ends up taking the blame for others’ misdeeds; *koza* (“nanny-goat”) in Russian is a term for a “tomboy.”

The author separates the goats into three groups – wild, domesticated, and feral – and devotes a separate chapter each to the domesticated goat and the feral goat. On page 21, there is a diagram of the evolution of the goat that shows the animals to which it is closely related: sheep,

musk ox, and antelope, to name a few. Size, length of life, and some unique behavioral characteristics are described in the first chapter. One unusual behavior is the use of scent to indicate the dominant male. Besides the use of its scent gland, the male urinates on its own face, beard, and front quarters. The goat’s urine scent indicates to others his physical condition.

An interesting genetic study of the hornless trait in goats reveals that the offspring of hornless goats produce a gender imbalance. There are more males born than females. Scientists determined that some of the males are hermaphrodite females. That is, they appear male but have two X chromosomes. Study of the location of the genes for horned/hornless and fertile/sterile revealed that these genes are very close to one another on chromosome 1. Breeders know that all goats with horns are fertile. Hornless female goats may or may not be fertile. If they are fertile and mate with a horned male, all the offspring will be fertile. This is an interesting twist to the usual horned/pollled cattle genetics problems used in high school biology classes. (The author’s description is more complete than I have space for here.)

Since there is confusion about mountain goats that are not classified as goats, the author addresses the question of how to distinguish sheep from goats. She gives a clear description contrasting the two groups of animals. Here is an opportunity to talk about classification with old methods compared to current methods.

The role of the domesticated goat in providing nutrition, especially in areas where there is little vegetation, is traced from early times to the 21st century. Currently, domesticated goat populations are flourishing. They provide meat, milk, medicine, and clothing in relatively small areas of land compared with cattle. The feral goat, on the other hand, has challenged the livestock of Australia. Goats can successfully live when vegetation is diminished by drought. Australia is trying to reduce the feral goat population. Here is a good example of the unexpected consequences of introducing a new species into an environment.

With interesting text, the photos and drawings give a better understanding of the nature and role of the goat. The information can be used by teachers to enhance their instruction in many topics in biology. This book champions the goat as a provider of nutrition, and as a key species in certain environments. Reading this book will enrich your appreciation of the animal known as *goat*.



Guinea Pig. That cute ball of fur has been a “key participant in numerous human enterprises – from farming and medicine to space travel and the pet industry.” Author Dorothy Yamamoto, a specialist in Medieval English Literature and a poet, provides an in-depth discussion of the name *guinea pig* and how it is used in ordinary language. Today, for example, everyone knows what is being talked about when people are said to be treated as “guinea pigs.”

The biological information in the book helps the reader understand how the guinea pig is classified as a distinct species, *Cavia porcellus*. This species originated through selective breeding by the people of the Andes of South America, the home of its closest relatives. There are no wild guinea pigs. Their reproductive capacity is lower than that of other rodents or of rabbits, because their gestation period is 63–75 days. However, they can become pregnant four weeks after birth. This information could be useful in a discussion of genetics and the characteristics of useful animals for studying genetic patterns. The great variety in the appearance of the guinea pig is shown in Chapter 5, “Experimental Animals,” and Chapter 6, “Pets, Plain and Fancy,” through both text and many photographs. A diagram on page 114 shows what is described as “desirable and undesirable shapes.” This is a good way to bring in the idea that selective breeding is based on human choice. Ask the students which of the two shapes of the guinea pig they prefer. On page 99 is a photograph of a poster showing Mendelian genetics accompanied by a description of the initial work of J. B. S. Haldane and his sister Naomi Mitchison – an interesting story. These two chapters can provide the biology teacher with many specific examples to enrich classroom presentations about scientific inquiry and genetics.

In Chapter 2, the author explains why the Andean people keep and use guinea pigs for food. Guinea pigs require little space, and keeping them provides protein that people in the grasslands receive from larger animals like cattle. This leads to one of the most fascinating chapters – Chapter 4, “On the Menu.” The author begins the chapter by pointing out that travelers to Peru or Ecuador enjoy telling others, via social media, about their experience when eating guinea pigs. However, her quoting of another poet’s first encounter with a cooked guinea pig includes more detail than I expected. What a way to introduce your students to other cultures! In turn, your students should be asked what they think the Peruvians think of our keeping guinea pigs as pets and not food.

In Peru, in addition to the animal’s use as food, guinea pig waste provides organic compost

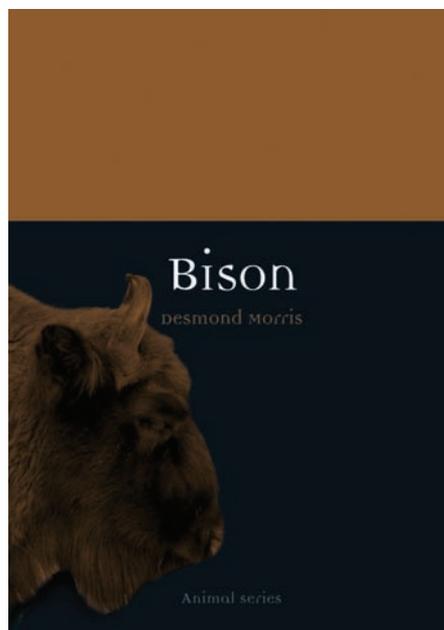
and, when stored, produces methane that can power electrical appliances. In Europe, they are seen in many paintings and drawings, used for entertainment, and described in poetry. The “tribbles” in the *Star Trek* episode “The Trouble with Tribbles” resemble guinea pigs, and guinea pigs are the heroes of the Disney movie *G-Force*.

Guinea pigs were used by William Harvey to study circulation and by Antoine Lavoisier to study respiration. As experimental animals they have played a role in winning 23 Nobel Prizes, including work on typhus and streptomycin. Their shared characteristics with humans (susceptibility to tuberculosis and inability to synthesize vitamin C) make them useful in the study of human diseases and nutrition.

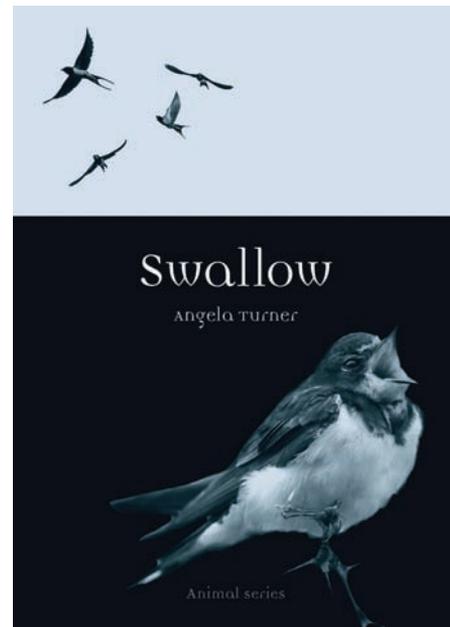
The author has provided a nicely organized story of the guinea pig. The images enrich the text. It is a worthwhile read, with the exception of the last chapter, “Tailpiece,” which appears to be an add-on. The little bit of information in this chapter could have been incorporated earlier without the embellishment of the story from Ludvík Vaculík’s *The Guinea Pigs*. You cannot come away from reading this book without appreciating all that the guinea pig has contributed over time. They are more than cute balls of fur.



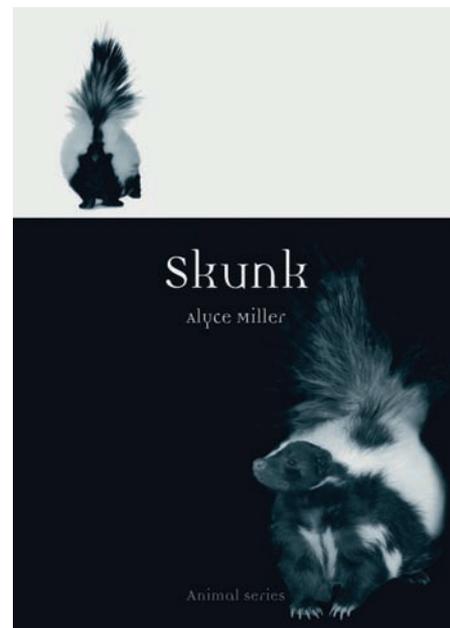
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Bison. By Desmond Morris. 2015. Reaktion Books. (ISBN 9781780234243). 198 pp. Paperback. \$19.95.



Swallow. By Angela Turner. 2015. Reaktion Books. (ISBN 9781780234915). 208 pp. Paperback. \$19.95.



Skunk. By Alyce Miller. 2015. Reaktion Books. (ISBN 9781780234908). 199 pp. Paperback. \$19.95.

Bison, *Swallow*, and *Skunk* are three of the latest additions to Reaktion Books’ “Animal” series, which stretches from A to (approximately) Z. From *Albatross*, *Ant*, and *Ape* to *Walrus*, *Whale*, and *Wolf* – and many in between – this series offers appealing overviews of 75 individual vertebrate and invertebrate animals. Each book presents a holistic view of its subject animal, including history, natural history, art, economics,