INSIGHTS

BOOKS *et al.*

AAAS/SUBARU SB&F PRIZES FOR EXCELLENCE IN SCIENCE BOOKS

Fodder for future scientists

From a monarch mystery unlocked with the help of Indigenous people to an environmental disaster averted by a chemist who was not afraid of a fight, this year's finalists for the AAAS/Subaru SB&F Prize for Excellence in Science Books highlight how diverse perspectives, grit, and a healthy dose of hope are essential to the effective practice of science. Read on for reviews of the finalists written by the staff of the *Science* family of journals, with help from a few friends. **—Valerie Thompson**

HANDS-ON SCIENCE BOOK

Chemistry for Kids

Reviewed by **Pamela J. Hines**[1]

If you were to choose 25 discoveries to document the progress of chemistry through millennia, what would you pick? In *Chemistry for Kids*, Liz Lee Heinecke takes us on such a journey, using familiar objects and simple scientific instruments to create straightforward chemistry experiments that chart the field's evolution over time.

Each chapter is centered on a different experiment and begins with a vivid illustration that highlights a scientist and his or her work. A few paragraphs of engagingly written introduction are followed by colorful photographs of youngsters demonstrating the steps of the experiment. A brief explanation of the chemistry that underlies each experiment wraps up each chapter.

The author's decision to include many women, even those not officially known as "scientists," is most welcome. Marie Curie's process of elemental precipitation, by which she extracted radium, is modeled (much more safely) with food coloring and rosemary leaves. Meanwhile, the environmental spread of the insecticide DDT that Rachel Carson brought attention to is visualized by the diffusion of food coloring through gelatin. Agnes Pockels, a pioneer of surface science, found inspiration in the bubbles that formed as she washed dishes. Using dish soap, milk, and food coloring, we can see for ourselves how surface tension drives the formation of colorfully abstract patterns.

The topics covered range broadly. Some chapters detail things we think of as part of everyday life (for example, soap or carbonated drinks). Other chapters touch on frontiers, including medicinal plant chemistry and crystallography. Older children could do many of these experiments on their own; younger children might need supervision.

Chemistry for Kids: Homemade Science Experiments and Activities Inspired by Awesome Chemists, Past and Present, Liz Lee Heinecke, Quarry Books, 2020, 128 pp.

This Is a Book to Read with a Worm

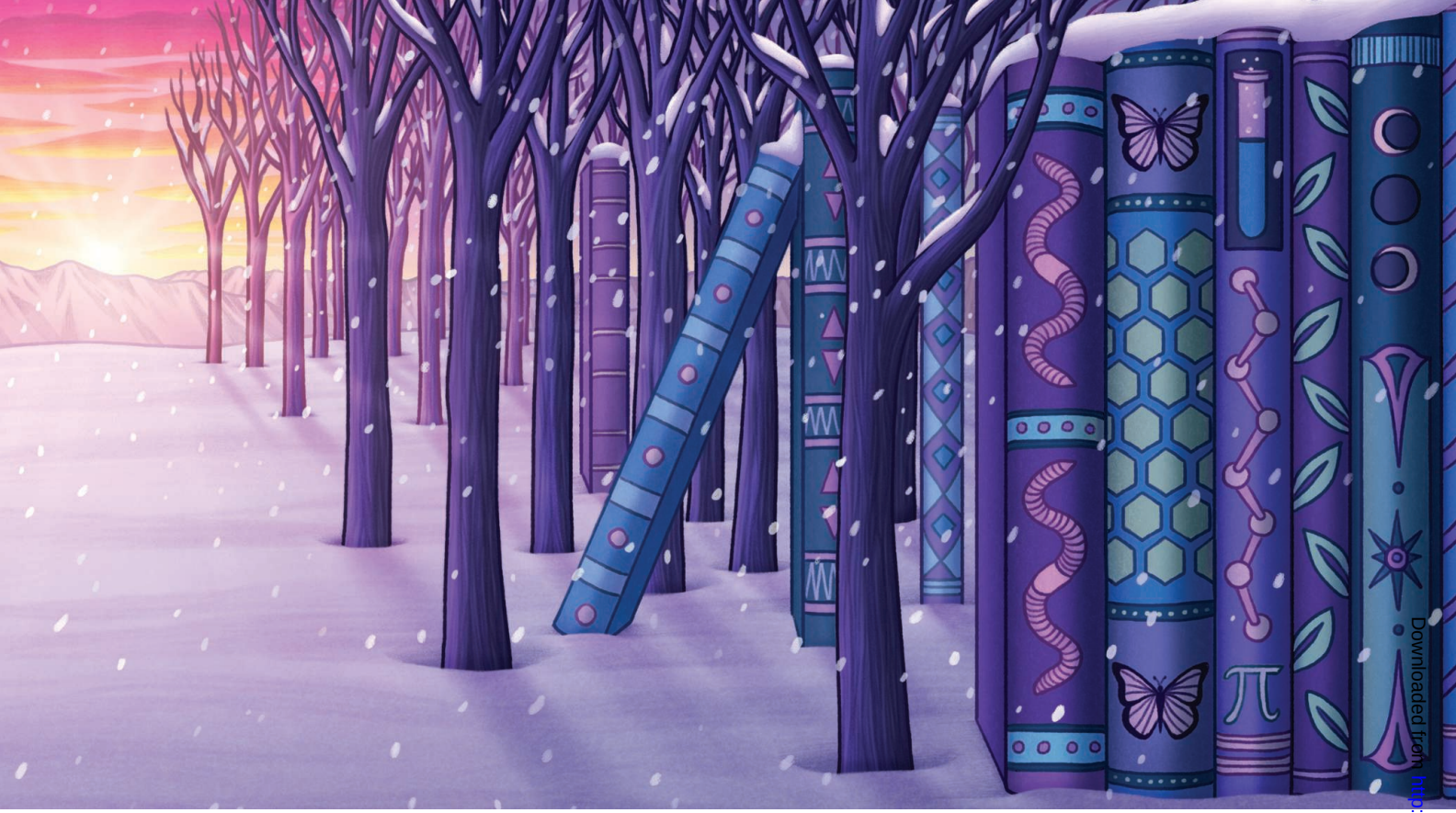
Reviewed by **Caroline Ash**[2]

Charles Darwin's final book was dedicated to the gradual way in which earthworms change the world by turning over soil (*1*). He was not the only early naturalist to appreciate this diminutive invertebrate. In the 18th century, Gilbert White acknowledged the "lamentable chasm" that would be left without the "small and despicable" worm to help make soil (*2*).

This Is a Book to Read with a Worm is a colorful delight and an important little book that follows in White and Darwin's footsteps, promising to help nurture a new generation of naturalists. It offers a mix of activities and facts about earthworms that a curious child could do independently (or, to be more precise, with an earthworm). The book starts

ILLUSTRATION: HANNAH AGOSTA

Published by AAAS



with guidance for how to catch a worm and how to care for it in a simple homemade terrarium. Several suggested experiments reveal information about worms' sensory responses and anatomy. For instance, by crafting a listening tube made from paper, you can hear them crawling thanks to the scratching of their barely visible setae.

Readers learn that in the United States, imported worm species are eating all the leaves that make up native earthworms' diet, to the detriment of native species. This could have profound consequences, not only for life underground but also for the viability of the forests that rely on the leaf consumption and soil churning capacity of native worms.

This Is a Book to Read with a Worm, Jodi Wheeler-Toppen, Illustrated by Margaret McCartney, Charlesbridge, 2020, 32 pp.

REFERENCES AND NOTES

1. C. Darwin, *The Formation of Vegetable Mould Through the Action of Worms, with Observations on Their Habits* (John Murray, 1881).
2. G. White, *The Natural History and Antiquities of Selborne* (Benjamin White, 1789).

You're Invited to a Moth Ball

Reviewed by **Seth Scanlon**[3]

Of all the insects that flitter and flutter into our homes, among the least welcome is the common clothes moth (*Tineola bisselliella*), which has a penchant for ruining shirts, sweaters, and sundry other garments. However, this perfidious pest is just one of more than 150,000 different moth species. In *You're Invited to a Moth Ball*, Loree Griffin Burns invites budding entomologists to embrace the "moth ball," a nocturnal occasion to encounter the myriad moth species that live just outside our homes.

The text, written in a warm and casual register, first describes how to employ a combination of fruit smeared on trees and specialized ultraviolet lights to attract moths to viewing stations made using light-colored sheets hung on clothes lines. The book then details what to expect of your lepidopteran guests and offers some advice for maximally enjoying your nighttime rendezvous (although it fails to offer advice about how to handle other wildlife that might seek to gate-crash the ball). Along the way, Burns provides some useful, if basic, information about moth biology.

The book's vibrant and inviting photographs, captured by Ellen Harasimowicz, are a true highlight. Indeed, the great variety and beauty of moths shown made me seriously consider gathering up the necessary supplies and having my own backyard moth party. However, the decision to omit captions, which might have explained the moths depicted in the photos, was a missed opportunity for further edification. I would have also liked to have seen more options for families who do not have access to backyards with trees. Still, this is a fun and engaging book that encourages children to explore the wonders of the world around them and that should hopefully spur them to seek out more in-depth sources of information, helpfully signposted in the book's "Resources" section.

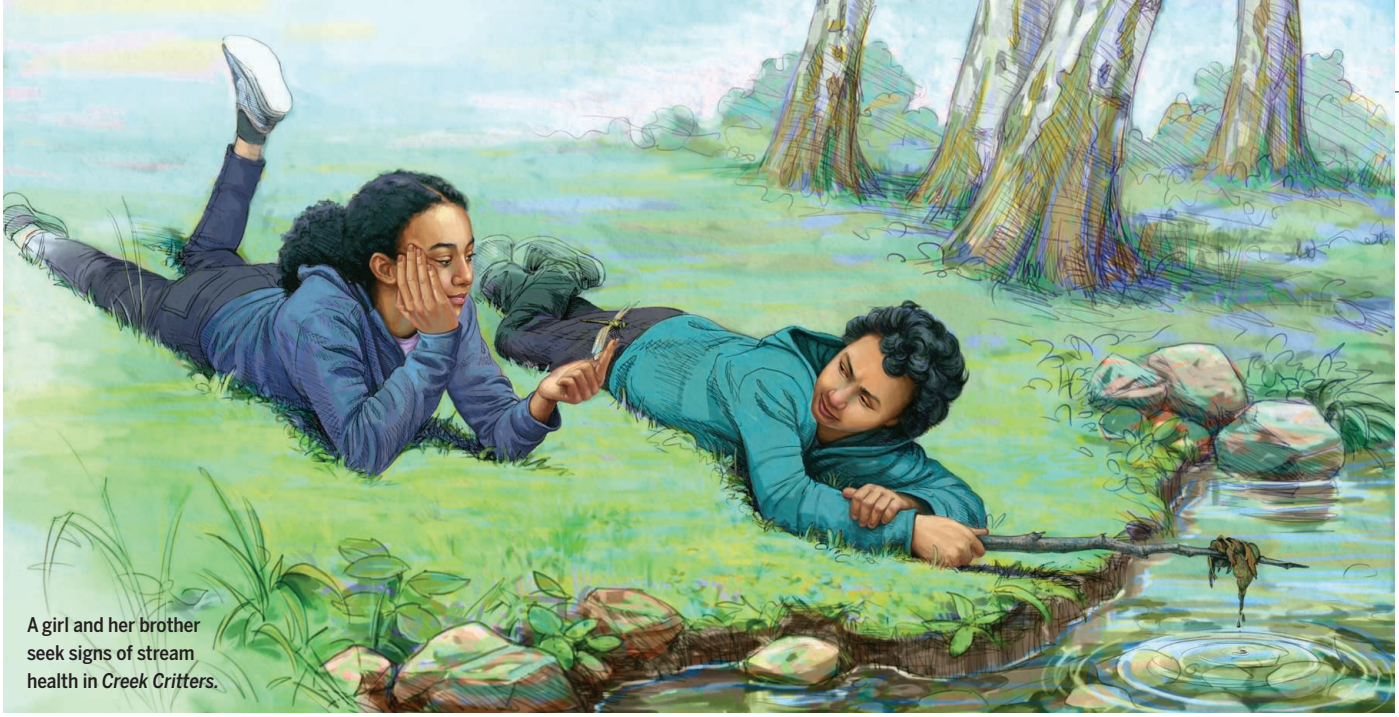
You're Invited to a Moth Ball: A Nighttime Insect Celebration, Loree Griffin Burns, Photography by Ellen Harasimowicz, Charlesbridge, 2020, 40 pp.

Creek Critters

Reviewed by **Trista Wagoner**[4]

Small streams are often overlooked and underappreciated, but they provide ample opportunities for curious kids to learn what it is like to be a scientist. In *Creek Critters*, a girl whose name we never learn invites her younger brother Lucas to explore a stream one might find in the mid-Atlantic region of the United States. The pair turn over rocks and scoop up rotting leaves in search of aquatic macroinvertebrates that ecologists use as indicators of a healthy ecosystem. Most of this short book focuses on insects, especially in larval forms, describing their sizes and shapes along with appealing, detailed illustrations and photographs. The children's goal is to find species, such as the mayfly and the caddis fly, that are sensitive to pollutants. "If we find them," the girl explains, "we'll know our creek is healthy."

The book ends with a few pages of activi-



A girl and her brother seek signs of stream health in *Creek Critters*.

ties, including a scavenger hunt and a template for recording observations about the environment. The last page lists noninsect biological indicators of stream health, such as snails, crayfish, and planaria. The publisher's website includes Spanish-language versions of the story (audio and text), and the Audubon Naturalist Society offers a "Creek Critters" companion app and additional activities.

I found myself wanting more from the book—more information about the importance of healthy streams, more explanation of how pollutants affect flora and fauna, and more illustrations—but most of all, it left me with the feeling that I want more time to explore my own nearby creeks. It may likewise provide inspiration and direction for children who enjoy getting their hands wet and their boots muddy.

Creek Critters, Jennifer Keats Curtis with Stroud Water Research Center, Illustrated by Phyllis Saroff, Arbordale Publishing, 2020, 32 pp.

CHILDREN'S SCIENCE PICTURE BOOK

Mario and the Hole in the Sky

Reviewed by **Sacha Vignieri**[5]

During the 1970s, a time when many embraced the motto "better living through chemistry," Mexican chemist Mario Molina questioned the safety of chlorofluorocarbons (CFCs) that had begun appearing in an increasing number of products, from refrigerants to medical aerosols. He wondered about the persistence of these compounds and their effects on the environment. When he realized that they were degrading the ozone layer, a key component of our atmosphere, he fought tirelessly against their use. In the end, he won the fight; laws were put in place around the world to limit the use of CFCs, but the path was not easy, and Molina and his colleagues faced vitriolic criticism.

With gentle and engaging imagery, *Mario and the Hole in the Sky* conveys Molina's story, rendering him first as a curious child obsessed with his microscope and later as a worried scientist determined to convince a skeptical public of the dangers of CFCs. The book urges readers to follow their curiosity and to be prepared to fight hard for the health of the planet. "We saved our planet once. We can do it again," Molina concludes at the end of the story, evoking an optimistic view of the world that is comforting and full of potential.

Molina, who passed away in October of this year (see Retrospective, p. 1170), worked tirelessly to educate the world about CFCs and overcame naysayers and critics to ensure that they were phased out of use. Today, the threats we face are even more complex, the resistance to change stronger, and the global political environment even less conducive to collaboration. Nonetheless, the impact of solid science, collaboration, and inspiration is still powerful. Molina's story, as presented in this lovely book, may help young readers see hope in similar efforts, and such hope will carry us forward in these challenging times.

Mario and the Hole in the Sky: How a Chemist Saved Our Planet, Elizabeth Rusch, Illustrated by Teresa Martínez, Charlesbridge, 2019, 40 pp.

The Boy Who Dreamed of Infinity

Reviewed by **Kelly Servick**[6]

This coming-of-age tale is so vibrant and imaginative that a reader might forget that it is also the true story of Indian mathematician Srinivasa Ramanujan, who made substantial contributions to number theory and the study of infinite series. Author Amy Alznauer, a math professor at Northwestern University, takes readers to Ramanujan's birthplace in South India at the turn of the 20th century.

We meet Ramanujan first as a cherished infant prophesied to become a great thinker. But for most of this story, we see a more relatable character: a bored student, irritating teachers with his precociousness and sneaking off to be alone with his thoughts. When Ramanujan contemplates a mango—mentally cutting it into smaller and smaller pieces—he stares into infinity. In clouds, temple statues, and his mother's folktales, Ramanujan sees numbers and mysteries. Despite his mathematical brilliance, he fails out of college and is left destitute, despairing that his ideas will never reach the wider world. Alznauer's story ends as Ramanujan accepts an invitation from mathematician G. H. Hardy to work and study in England—a decision that will propel Ramanujan to greatness.

By focusing mainly on his youth, *The Boy Who Dreamed of Infinity* offers only vague glimpses of Ramanujan's ultimate contributions to mathematics. But the book's message transcends the world of academic research. This vivid story, which tumbles across the book's pages in Daniel Miyares's kinetic

illustrations, celebrates the power of a self-assured and independent child. It could encourage young readers to identify their own passions and acknowledge their own brilliance before the adult world gets wise.

The Boy Who Dreamed of Infinity: A Tale of the Genius Ramanujan, Amy Alznauer, Illustrated by Daniel Miyares, Candlewick, 2020, 48 pp.

Winged Wonders

Reviewed by **Jeffrey Mervis**[7]

It should not be hard to interest children in a story about monarch butterflies. But Meeg Pincus, the author of *Winged Wonders*, has a more ambitious goal: to teach them how scientists go about their work.

Her story starts by introducing readers to Canadian zoologists Fred and Norah Urquhart, who began studying monarch migration patterns in the 1940s. Pincus then presents a cast of supporting characters, including citizens who answered ads asking people to tag the monarchs living in their neighborhoods, a couple who followed the monarchs throughout Mexico, and the villagers who celebrated the fall arrival of the monarchs, which roost in the oyamel tree groves high in the Sierra Madre. Large, lush drawings by illustrator Yas Imamura invite children to insert themselves into the story.

Pincus does not stop at retelling the Urquharts' story. Instead, she encourages readers to contribute to the ongoing research on monarchs and to work to protect their habitats.

The book's bare narrative is supplemented by a final page filled with details about the Urquharts and those who have followed in their footsteps. However, those with additional questions—for example, why do monarchs migrate, and do they all travel such great distances?—will need to consult other sources. But that is a minor quibble if this mystery story kindles your child's interest in this iconic species and environmental stewardship.

Winged Wonders: Solving the Monarch Migration Mystery, Meeg Pincus, Illustrated by Yas Imamura, Sleeping Bear Press, 2020, 40 pp.

Honeybee

Reviewed by **Jennifer Sills**[8]

In *Honeybee: The Busy Life of Apis Mellifera*, Candace Fleming uses rhythmic, meditative prose to describe the short life of a honey bee. The story begins as Apis "squirms, pushes, chews" through her wax cell into the "teeming, trembling flurry" of the hive. She feeds larvae, tends to the queen, builds honeycomb cells, handles food, and guards the hive. Finally, in a climactic four-page spread, Apis takes flight. But her work is not done; before she stills, Apis will fly 500 miles and visit 30,000 flowers. On her 35th day, as Apis's story comes to an end, another honey bee emerges from her "solitary cell."

Vivid oil paintings illustrate Apis in meticulous detail, along with her fellow bees and the world she travels. The story gives readers an appreciation of the many hidden tasks that take place inside a beehive, as well as the cooperative structure of a bee colony, where each individual contributes to the group in a variety of ways.

At the end of the book, an appendix provides information about honey bees' crucial role in human food production, the threat of colony collapse disorder, and what readers can do to help. A final section adds information about the other occupants of the hive—the queen and drones—and more details about the intriguing dance performances that honey bees use to communicate the location of flowers to one another.

Honeybee: The Busy Life of *Apis Mellifera*, Candace Fleming, Illustrated by Eric Rohmann, Neal Porter Books, 2020, 40 pp.

MIDDLE GRADES SCIENCE BOOK

Can You Hear the Trees Talking?

Reviewed by **Marc S. Lavine**[9]

We often think of trees when the leaves change color in the fall or when devastating forest fires, disease, or invasive species lead to widescale loss. Few of us take the time to consider, however, the many parallels that exist between trees and more mobile creatures. Trees can form communities, in which elders nurture and educate the young. Collectively, they can moderate the local temperature and humidity, store water, and protect each other. Isolated trees may mature faster than trees surrounded by others of the same species, but this accelerated growth can harm the lone tree's longevity. In *Can You Hear the Trees Talking?*, Peter Wohlleben provides a fascinating and detailed guide to these less appreciated aspects of tree life.

Trees use senses akin to taste and smell to detect and deter predators and alert neighboring trees. However, much of the communication in a forest occurs belowground. Neighboring tree roots of the same species share nutrients and pass along messages about local threats. Fungi that live off dead trees or leaves send out a network of fine threads that act like a highway for chemical messages. But this relay service comes at a cost: Fungi can demand up to a third of the sugar that a tree produces, and they will sometimes share that sugar with trees of other species to aid their own preservation.

Wohlleben wrote this book as a young reader's edition of *The Hidden Life of Trees* and has done a remarkable job ensuring that each page tells a complete story, answering questions ranging from how trees know when it is spring to why trees are important in the city. Activities and quizzes appear throughout the book to engage readers of all ages.

Can You Hear the Trees Talking? Discovering the Hidden Life of the Forest, Peter Wohlleben, Translated by Shelley Tanaka, Greystone Kids, 2019, 84 pp.

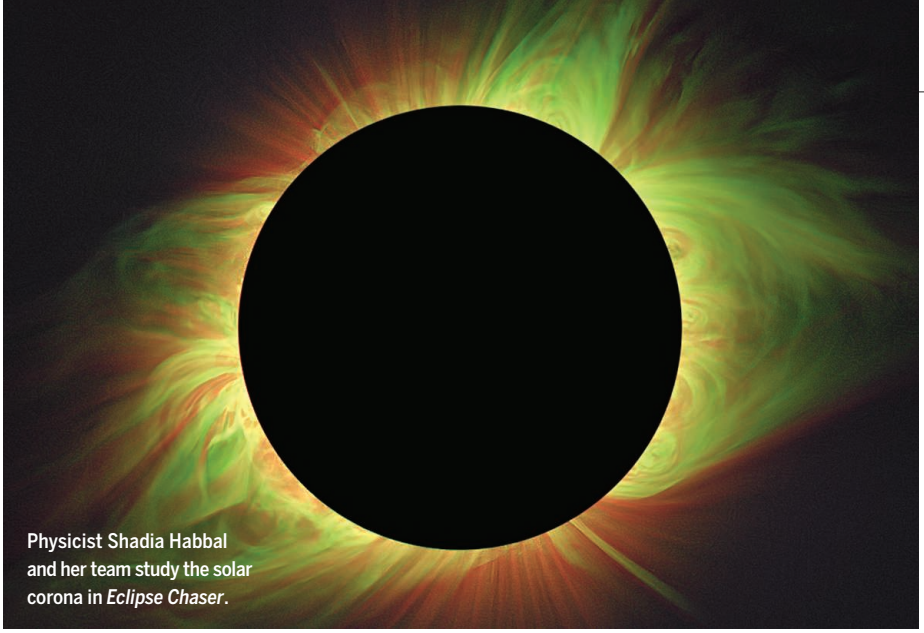
Eclipse Chaser

Reviewed by **Adrian Cho**[10]

On 21 August 2017, the Moon glided between Earth and the Sun, creating an eclipse visible across the United States. Millions of people flocked to the path through 13 states along which the Moon would completely cover the disk of the Sun and create a total eclipse—among them were Shadia Habbal, a solar physicist, and her team. In *Eclipse Chaser*, science reporter Ilima Loomis recounts their exciting yet sometimes anxious expedition to study the solar corona, the Sun's atmosphere, which is visible only during a total eclipse.

Whereas many solar physicists rely on huge purpose-built telescopes on the ground and in space to study our at times capricious little star, Habbal relies instead on eclipses and portable telescopes to probe the still poorly understood corona, trekking to remote peaks and deserts, where bad weather or a sudden sandstorm can spoil months of preparation.

Loomis deftly explains the mechanics of



Physicist Shadia Habbal and her team study the solar corona in *Eclipse Chaser*.

an eclipse and the questions Habbal is trying to answer. She conveys the homey feel of the expedition, on which Habbal's sister treats the team to a homemade chicken dinner. In a gratifying nuance, Loomis notes that, for years, Habbal seldom looked at the corona herself, as she was always too busy tending to her instruments and cameras. Only now that the systems run automatically can she turn her eyes skyward.

Eclipse Chaser teems with intriguing photos snapped by Amanda Cowan. Visually, the Sun is the real star of the show. The eerie photos of its gossamer corona stretching out across the darkened sky may make the reader long to see it in person. If he or she is so inclined, the book includes a handy map that shows the paths of total eclipses through 2060.

Eclipse Chaser: Science in the Moon's Shadow, Ilima Loomis, Photography by Amanda Cowan, HMH Books for Young Readers, 2019, 80 pp.

Growing Up Gorilla

Reviewed by **Cathleen O'Grady**[11]

Baby gorilla Yola faces a singular challenge: Her mom, Nadiri, was raised by humans and does not know how to parent. *Growing Up Gorilla* tells the story of the pair's blossoming bond as the keepers at Seattle's Woodland Park Zoo care for the newborn gorilla and gently encourage Nadiri's maternal instincts.

Clare Hodgson Meeker's deft storytelling weaves together Yola's first few months of life and Nadiri's experience of being raised by humans. The zookeepers explain that they are eager to develop the bond between mother and baby because Yola will best learn life skills that way. The result is a gentle but surprisingly gripping narrative with finely drawn central characters.

Animal-mad children will love both the story and the abundant photography. Close-up shots of Yola and her family offer insight into the emotional bond and life of the gorillas. Sidebars that explain gorilla biology, society, and behavior serve as either useful breathers or mildly jarring distractions, depending on the reader's attention span.

This is a book that packs a hefty educational punch in a delightful package. Readers will finish with an understanding of the close evolutionary relationship between humans and other primates and the precarious conservation status of gorillas. Most importantly, as they watch Yola flourish by "growing up gorilla," they will learn that the best way to love and respect nonhuman animals is by keeping a little bit of distance.

Growing Up Gorilla: How a Zoo Baby Brought Her Family Together, Clare Hodgson Meeker, Millbrook Press, 2019, 48 pp.

Condor Comeback

Reviewed by **Laura M. Zahn**[12]

In 1987, the last California condor in the wild was taken into captivity. Along with 21 others of its kind—together representing the last of the species—the bird was used to launch a captive breeding program. The eventual goal of the program was to return condors to the wilds of the western United States. Part of the Scientists in the Field series, this book tells the condor's comeback story through the work of conservation scientist Estelle Sandhaus, director of conservation and science at the Santa Barbara Zoo, and her collaborators. The book details Sandhaus's efforts to identify how human intervention can ensure that individual birds thrive outside of captivity, thereby ensuring that the wild population will grow.

Condors still face multiple threats, including potentially serious health risks associated with eating "microtrash" (for example, small pieces of metal, shards of glass, or plastic packaging) and carcasses containing lead shot. The book takes readers along on a health assessment of wild birds and highlights the many ways in which they are monitored, providing insight into the job of a conservation scientist. Monitoring, together with captive breeding and reintroduction programs, community outreach, and policies banning lead shot, has resulted in successful reproduction and reintroduction into the wild.

Today, there are more than 450 California condors, about half of which are living in the wild. However, more conservation scientists are needed to ensure the species' continued success. Hopefully this book will encourage children to consider entering this field.

Condor Comeback, Sy Montgomery, Photography by Tianne Strombeck, HMH Books for Young Readers, 2020, 96 pp.

YOUNG ADULT SCIENCE BOOK

The Last Stargazers

Reviewed by **Keith T. Smith**[13]

When a young person imagines an astronomer, they likely picture a white-coated individual who spends each night peering at the sky through a small refracting telescope on a roof. But, as Emily Levesque recounts in *The Last Stargazers*, the reality of being a professional astronomer is very different.

Observational astronomers must apply months in advance for competitive time on a limited number of giant telescopes in remote locations, perhaps securing just a few nights per year. After traveling to the observatory, they must work through the night from a control room, trying to collect enough photons to produce a result. The weather is a constant threat—if it is unfavorable, weeks of work and travel could result in no data at all. Levesque successfully captures the strange mix of excitement, impatience, camaraderie, and sleep deprivation that I recognized from my own observing trips and relates numerous anecdotes about uncooperative wildlife, malfunctioning equipment, natural disasters, and idiosyncratic observatory staff.

The book is partly autobiographical—Levesque is a professional astronomer who studies massive stars—weaving the author's experiences with highlights from interviews. Historical tales of famous observers, such as Edwin Hubble and Vera Rubin, include a discussion of how many female astronomers

PHOTO: MILOSLAV DRUCKMÜLLER, SHADIA HABBAL, PAVEL ŠTARHA, JUDD JOHNSON, JANA HODEROVÁ; IMAGE PROCESSING BY MILOSLAV DRUCKMÜLLER

had to overcome gender bias. Levesque's emphasis is on optical astronomy, although she does mention radio telescopes and the new methods of gravitational wave astronomy, with a disappointingly heavy focus on American astronomers and U.S. facilities.

The book's final chapters cover recent shifts toward remote-controlled, queue-scheduled, or fully automated observing. While such methods are cheaper, more efficient, and more environmentally friendly, they do diminish the drama and wonder of professional astronomical observing. *The Last Stargazers* may ultimately become a historical record of a dying way of doing science.

The Last Stargazers: The Enduring Story of Astronomy's Vanishing Explorers, Emily Levesque, Sourcebooks, 2020, 336 pp.

Borrowing Life

Reviewed by **Yevgeniya Nusinovich**[14]

Borrowing Life by Shelley Fraser Mickle tells the story of the pioneering 20th-century surgeons, scientists, and patients who made organ transplantation a reality. Although the book's primary focus is on kidney transplantation, Charles Woods—a young pilot who, in 1944, was severely burned in an airplane accident and unexpectedly survived with the aid of donor skin grafts—takes center stage in the first half of the story.

Joe Murray, the surgeon who treated Charles, and one of the central figures in Mickle's book, would go on to join a team of talented physicians under the supervision of surgeon Francis Moore, where he drew on immunologist Peter Medawar's animal studies to successfully execute the first human kidney transplant in identical twins in 1954. Mickle recounts how the subsequent application of the team's technique using unrelated donors gradually became feasible with careful calibration of immunosuppression.

Although Mickle met both Murray and Moore decades before writing this book, *Borrowing Life* draws primarily from archival documents, including memoirs written by the participants and contemporaneous news coverage. It is written in an informal style, as a series of disparate anecdotes that gradually converge on a single story.

Mickle makes an unusual narrative decision, framing the medical tale with the love stories of the key participants (Woods, Murray, Moore, and Medawar) and their wives. Her attempt to recognize the efforts and personal costs incurred by women with history-making husbands is appreciated, as many biographies take such sacrifices for granted. Unfortunately, the execution of this strategy often falls flat because Mickle offers few details about the wives' actual contributions. Nevertheless, the book presents a set of compelling stories that may be eye-opening for readers who have grown up in a time when organ transplantation is taken for granted.

Borrowing Life: How Scientists, Surgeons, and a War Hero Made the First Successful Organ Transplant a Reality, Shelley Fraser Mickle, Imagine, 2020, 288 pp.

Wading Right In

Reviewed by **Andrew Sugden**[15]

Too often, wetland ecosystems are viewed as an unproductive obstacle to useful human projects, and they have accordingly suffered—like so many other natural ecosystems—the depredations of development. Recognizing that the general public may "lag in their appreciation" of wetlands, Catherine Koning and Sharon Ashworth have set out on a mission to generate a wider interest in these fascinating and beautiful ecosystems, with a blend of science, natural history, and the personal stories of ecologists, wetland managers, conservationists, and more.

Their focus is mainly the wetlands of the northeast United States—the plants and creatures that inhabit them and the people whose lives are enhanced by them. The book's chapters are organized by wetland type—saltmarsh, forest wetlands, swamps, vernal pools, etc.—with final chapters on wetland restoration and on the connections between people and wetlands, both at the personal and community level. The book has a bibliography and plenty of further reading for readers wanting to dive in more deeply.

The importance of wetlands cannot be overstated. They play a vital carbon sequestration role in a changing climate. Coastal wetlands are also a protective bulwark between ocean and dry land and provide a haven for a huge range of resident and migratory wildlife. The authors' efforts to highlight these benefits and to inspire a love of—or at least a tolerance for—mud, wind, and damp, flat horizons make this book an excellent and engaging introduction to these ever-changing ecosystems.

Wading Right In: Discovering the Nature of Wetlands, Catherine Owen Koning and Sharon M. Ashworth, Illustrated by Catherine Owen Koning, University of Chicago Press, 2019, 264 pp.

The Alchemy of Us

Reviewed by **Mark Miodownik**[16]

The questions of how much of our humanity is due to material wealth and how our cultural values are baked into the materials we create are the subject of Ainissa Ramirez's fascinating new treatise, *The Alchemy of Us*.

Ramirez's meditation on the materials that have facilitated community is particularly illuminating. Here, she writes about the phonograph's impact on how music was enjoyed. The ability to record music meant that the experience of listening to it no longer had to be a communal one and spelled the end of much homemade folk music defined by materials such as brass, wind, or strings, but it also opened up uncharted horizons. The recordings allowed a cross-fertilization of musical culture between jazz, blues, and rock and roll, even as the musicians themselves remained segregated by race politics.

On the subject of race, Ramirez argues that a society that is racist will reflect racism in the substances that it makes. Because dark skin absorbs more light than white skin, for example, early photographs of black people were often barely recognizable. And although the cultural bias embedded in color film was corrected through chemical reformulations, it reemerged decades later in digital photography's automatic facial recognition, which frequently fails to detect darker skin tones.

The culture of innovation, Ramirez maintains, does not belong only to privileged elites; it can be found in all those who care enough to reinvent the material world and, as a result, themselves. ■

The Alchemy of Us: How Humans and Matter Transformed One Another, Ainissa Ramirez, MIT Press, 2020, 328 pp.

For a full-length review of *The Alchemy of Us*, see *Science* **368**, 41 (2020).

10.1126/science.abf5636

[1]The reviewer is a senior editor at *Science*. Email: phines@aaas.org [2]The reviewer is a senior editor at *Science*. Email: cash@science-int.co.uk [3]The reviewer is an associate editor at *Science*. Email: sscanlon@science-int.co.uk [4]The reviewer is a managing editor at the *Science* journals. Email: twagoner@aaas.org [5]The reviewer is a deputy editor at *Science*. Email: svignier@aaas.org [6]The reviewer is a news writer at *Science*. Email: kservick@aaas.org [7]The reviewer is a senior correspondent at *Science*. Email: jmervis@aaas.org [8]The reviewer is the Letters editor at *Science*. Email: jsills@aaas.org [9]The reviewer is a senior editor at *Science*. Email: mlavine@aaas.org [10]The reviewer is a news writer at *Science*. Email: acho@aaas.org [11]The reviewer is a news intern at *Science*. Email: cogrady@science-int.co.uk [12]The reviewer is a senior editor at *Science*. Email: lzahn@aaas.org [13]The reviewer is a senior editor at *Science*. Email: ksmith@science-int.co.uk [14]The reviewer is a senior editor at *Science*. Email: ynusinov@aaas.org [15]The reviewer is a senior editorial fellow at *Science*. Email: asugden@science-int.co.uk [16]The reviewer is at the Department of Mechanical Engineering, University College London, London WC1E 7JE, UK. Email: m.miodownik@ucl.ac.uk

Fodder for future scientists

Pamela J. Hines, Caroline Ash, Seth Scanlon, Trista Wagoner, Sacha Vignieri, Kelly Servick, Jeffrey Mervis, Jennifer Sills, Marc S. Lavine, Adrian Cho, Cathleen O'Grady, Laura M. Zahn, Keith T. Smith, Yevgeniya Nusinovich, Andrew Sugden and Mark Miodownik

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