Appendix 5
Recommended Literature for Science Classrooms

2016 Science Framework

FOR CALIFORNIA PUBLIC SCHOOLS
Kindergarten Through Grade Twelve

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To view the remaining sections of the 2016 California Science Framework on the CDE website, go to:
https://www.cde.ca.gov/ci/sc/cf/cascienceframework2016.asp

Items in this document that relate to crosscutting concepts are highlighted in green and followed by the abbreviation CCC in brackets, **[CCC]**, with a number corresponding to the concept. The same items that correspond to the science and engineering practices are highlighted in blue and followed by the abbreviation SEP in brackets, **[SEP]**, with a number corresponding to the practice.

The Web links in this document have been replaced with links that redirect the reader to a California Department of Education (CDE) Web page containing the actual Web addresses and short descriptions. Here the reader can access the Web page referenced in the text. This approach allows CDE to ensure the links remain current.

Recommended Literature for Science Classrooms

> *Literature is the most astonishing technological means that humans have created, and now practiced for thousands of years, to capture experience. For me the thrill of literature involves entering into the life worlds of others. I'm from a particular, constricted place in time, and I suddenly am part of a huge world—other times, other places, other inner lives that I otherwise would have no access to.*
> — Stephen Greenblatt, *The Swerve: How the World Became Modern*

In the quote above, Stephen Greenblatt, a professor of humanities at Harvard and the 2012 Pulitzer Prize winner for nonfiction, offers a view of reading as a tool to extend experiences beyond what otherwise is possible in regular life. This is particularly relevant when addressing the experiences students have in the science classroom and when offering them the opportunity to become life-long learners of science. Reading is a basic and essential skill for every student in science. However, reading in the science classroom goes beyond the ability to comprehend and gather information from text material. Students not only read to interpret text, decode tables and graphs, and understand equations, but also to have an experience with the content of that text. In turn, this experience can be used to engage and motivate students to explore the topic further on their own. A positive experience with informational and literary texts allows students' imaginations to expand and their interest in scientific literature to deepen.

In this section, recommendations are made to provide teachers with examples of a variety of literature resources that might stimulate students' minds and deepen their understanding of science and engineering topics related to the CA NGSS. Trade books provide a valuable addition to the science curriculum, in particular in grades K–5. These texts, supplementing and not replacing science instruction, broaden the genre of the written

materials to not only include science information books, but also fiction, narrative, and even poetry. The use of these texts provides opportunities to expand students' interests in science by connecting scientific content to topics relevant to their lives. In addition, these texts allow students to examine scientific content through the lens of different literary genres. Another valuable resource is the *Outstanding Science Trade Books for Students K–12*, published annually by the National Science Teacher Association. This list of award-winning books is researched and approved each year by educators. The 2015 list is available at the National Science Teachers Association (NSTA) Books and Resources Web page at https://www.cde.ca.gov/ci/sc/cf/appx5.asp#link1.

The *English Language Arts/English Language Development Framework for California Public Schools: Kindergarten Through Grade Twelve* (CDE 2015) provides guidance on using a variety of texts in the classroom. First, there is an interdisciplinary expectation that the development of each student's literacy skills is a shared responsibility—science teachers collaborating with teachers of other academic content subjects for an integrated model of literacy across the curriculum. Furthermore, there are a few things to consider when you are using literary and informational text during science instruction.

Most importantly, reading trade books with a science link, tales about science investigations, historical case studies, or biographies of scientists or engineers is fascinating and can greatly enhance the learning experience. A fundamental way to foster student motivation and engagement is through a variety of nonfiction reading selections. Joy Hakim's book *Reading Science Stories* helps the reader appreciate science through real-life scenarios. It is through narrative nonfiction that a student may possibly relate to the experiences of a scientist and be encouraged to engage in the practices of science. The book offers 22 different stories of scientists; it explores how they approached problems and provides insight into their life experiences. However, reading trade books or narrative nonfiction does not replace the need for students to actually *do* science.

Literature circles, long used in ELA classrooms, are successful with science-based nonfiction as well (Straits and Nichols 2006; Wilfong 2009) and have been shown to help with access and equity (Ogbomo 2014). For an overview of how to incorporate literature circles in a science classroom, see the NSTA Books and Resources Web page at https://www.cde.ca.gov/ci/sc/cf/appx5.asp#link2.

Informational text fits naturally into the 5E (Engage, Explore, Explain, Elaborate, and Evaluate) lesson cycle after students have had prior experience with the science ideas under review. After seeing a phenomenon, experiencing a discrepant event, or exploring with materials, students are primed to glean information from written text.

Nonfiction literature is intended for use with hands-on activities to challenge thinking, scaffold understanding, and enhance the learning experience. Children's literature can serve as a springboard for science investigations. Many elementary teachers are comfortable using trade books as part of their ELA instruction. The questions that many teachers ask during the reading of trade books can be modified to be more science-based. (See chapter 11 on instructional strategies in this framework for question stems that promote scientific thinking and reasoning.)

Some science-themed trade books can also be used to promote investigations. Teachers can stop reading aloud during strategic points in the text to give students the opportunity to generate researchable questions and follow up with an investigation before finishing the story. A wide variety of resources share ways to effectively use fictional trade books to enhance and support science investigation (Ansberry and Morgan 2004; Ansberry and Morgan 2005; Butzow and Butzow 1989; Butzow and Butzow 1998; Brainard and Wrubel 1993; Flagg and Ory 2002; Freedman 1999; Gertz, Portman, and Sarquis 1996; Glandon 2000; Morgan and Ansberry 2013; Royce, Morgan, and Ansberry 2012; Shymansky, Yore, and Hand 2000; Staton and McCarthy 1994a; Staton and McCarthy 1994b).

Connecting Science and Literature

This appendix provides teachers with resources to locate and use literature in their classrooms. While finding appropriate nonfiction and fiction is important, so too is how that literature is incorporated in teaching. There are a few important points that need to be made regarding how science and literature are related and connected.

Reading science content alone through the use of informational text or fictional stories with a science theme is not sufficient for learning science. When used effectively, having students read science content can help shape their scientific understanding. Often it is best to have reading come later in the learning sequence, allowing students the opportunity to improve their mental models of scientific phenomena and find answers to questions they have generated. However, a well-chosen piece of fiction or nonfiction can also serve to engage students and may generate a spark at the beginning of an instructional sequence. Literacy strategies, regularly employed in other subject areas, also work in the context of science. Using science as the context for weaving content and literature together will help support the development of literacy skills—reading, writing, speaking, and listening—and the understanding of science.

1-PS4-1. Plan and conduct investigations to provide evidence that vibrating materials can make sound and that sound can make materials vibrate. [Clarification Statement: Examples of vibrating materials that make sound could include tuning forks and plucking a stretched string. Examples of how sound can make matter vibrate could include holding a piece of paper near a speaker making sound and holding an object near a vibrating tuning fork.]

Case Study #1

Grade 1 Mrs. B started a unit on sound and the interaction between sound and vibrations. Analysis of the CA NGSS standards for the grade level indicates the students need to focus on the concept that sound makes vibrations and vibrations make sound. Mrs. B did not think her students connected vibration as the cause of sound or that sound causes vibrations. The crosscutting concept of cause and effect and observation of patterns between different sounds were important parts of understanding sound. Mrs. B selected a nonfiction literature book that she predicted would explain more about how sound causes movement/vibrations and vibrations cause sound. She read the book after the students had participated in several sound explorations and had developed questions about the activities.

Mrs. B began the learning sequence at the carpet circle by asking the class to think- pair-share in response to the question "What makes sound?" After pairs of students discussed the prompt, Mrs. B asked the students to respond by verbalizing what their partner had said about sound. Students used the prompt "My partner said . . ." as the teacher recorded responses on a circle chart with sound in the center. The partner talk (ELD strategy) was used to chart responses visually on the board. Responses on the chart included "My dog barks," "My cat meows," "The car makes sounds," "Phones make sounds," and "I make sounds." Mrs. B listened for the moment when children mentioned they make sounds.

Mrs. B asked the children if they all were able to make a sound. To open the activity, she said, "Let's figure out what happens when we all make a sound (phenomenon)." She then asked students if they thought a person who is deaf would know if sounds were being made. She asked the students to touch their own throats when they say the sentence "I like to go outside to play." She asked children to describe what they felt. Responses included buzzing, moving, tickling, and wiggling. She added that the word *movement* could also be called *vibration*. Next she asked each student to touch his or her partner's throat while the partner said the sentence and to explain to the partner how it felt while the partner was talking. She revisited the question about someone who cannot hear being able to recognize that a sound was being made. Mrs. B then read a story to the class, *I Have a Sister, My Sister is Deaf* by Jeanne Whitehouse Peterson. The book describes two sisters; although one sister cannot hear, she can feel vibrations. The narrator describes all that her sister can do, including the sensing of vibrations. Mrs. B told the students that they would try to recognize and feel vibrations, just like the character in the book.

Mrs. B next presented the class with a challenge to find out if sound always causes something to move or vibrate. She set up two stations to explore: one with water tubs and tuning forks and another with a drum with grains of rice in the center of the drum. She explained their job was to find out if sound caused something to move and then record in

pictures or words what they observed. Children became very animated as they observed the rice jumping on the drum and the water rippling from the tuning fork. Mrs. B asked questions that focused the students on the cause and effect of the moving water and rice: "What caused the rice to jump? Can rice jump without sound? What made the water move? Would it move without the sound of the tuning fork?" Mrs. B observed that the children were able to say sound was the cause of the movement, but they were not able to articulate the idea that sound caused vibrations.

Mrs. B brought the children back to the carpet to debrief what caused movement and to further explore what stops movement. She asked them to describe what happened at both stations. Children were able to describe that something moved or vibrated when they made a sound. Mrs. B went on to ask students to think-pair-share in response to the question "How can we stop the sound?" Responses included "Stop hitting the drum" and "Stop hitting the tuning fork." She asked, "What else could we do?" One student said, "Hold the fork tight." Mrs. B used the response for the next challenge.

She asked, "Let's find out if we can stop the sound if we stop the vibration or movement." There were also two stations for exploration number two. Children were asked to figure out how to stop the sound of clinking metal spoons swinging from strings and stop the sound of the tuning fork. The class quickly figured out ways to stop the movement—the vibration—and the effect of stopping the vibration was to stop the sound.

Mrs. B brought the class back to the carpet and asked them to check their throat movement as they talk about what makes sound. She asked several questions: "Does your throat move? Do all things move or vibrate when sounds are made? What caused the vibration/movement on the tuning fork or the spoons? How did you stop the vibrations? How might we stop vibrations and still have sound? Can we stop sound and still have vibrations?" The children were not sure if stopping vibration would cause sound to stop.

Mrs. B asked the children to think-pair-share about questions they might have about sound and vibrations. She charted questions including "Can moving things make sound? Can something make a sound and not vibrate? Do big sounds make more vibrations? Do small sounds make small vibrations?" Mrs. B charted all the questions and explained that they could find out some answers to their questions in a book. She brought out a book for a read aloud (or partner reading) about sound and asked the children to listen for the answer to their question or a question they liked. She gave them a moment to pick their question.

Mrs. B read *What is Sound?* by Charlotte Guillain and asked children to listen for information in the book that answered the questions. Responses were recorded next to each question. Some questions were not answered, so Mrs. B said she would look for books or other things to try to answer those questions. She explained to the children that the next day they would make an instrument that vibrates and see if it produced sound when it vibrated.

The pattern for Mrs. B's learning sequence was based on knowledge about how people learn; it was designed to weave cause and effect, collecting and analyzing data, and the core idea that sound makes vibrations and vibrations make sound. The pattern includes the following: (1) beginning with a real-world phenomenon, such as children feeling movement when they speak; (2) explorations to illustrate the scientific concept with hands-on materials including making sounds and stopping sounds; (3) debrief questions that help students make

the connections between the cause of sound and the effect of vibrations and the reverse; (4) further questions critical in helping student's generalize explorations and build solid connections; and (5) informational text to connect students' experiences and answer questions they developed.

In a first-grade class, the literature was read aloud or printed on a large chart. The words about vibrations and sound were introduced in the context of science explorations, charting, debrief questions, and student-partner talk in order to make these concepts accessible to all students including English learners. Students developed an understanding of vibrations in a rich context and described vibrations in their own words before the term was introduced.

This pattern of instruction is appropriate for all levels. Selection of experiences and reading material changes with maturity.

1. Engage in phenomena.
2. Explore with materials. (Multiple explorations are important for generalizations.)
3. Debrief or explain what is explored.
4. Generate further questions.
5. Read to answer questions (whole-class, partner, and individual reading are always done with a purpose).

Incorporating fictional text with a science-based theme can be a nice enhancement to your lesson. Again, to be clear, this is not a substitute for science instruction. However, there are many ways that fictional stories can support science instruction. Stopping at points to critique the science content, conducting investigations to see if what is reported in the story is actually true, and using scientific thinking to analyze what's written all work to help students be critical consumers of information—all while appreciating a good story.

Mrs. B read *The Happy Hedgehog Band* by Martin Waddell. This story is about animals that make and play drums and other musical instruments. Mrs. B read the story once. The story was then read a second time and the class developed a two-column chart with the headings "Real" and "Not Real." Students were asked to listen for things animals can really do and things that are pretend or not real. Debriefing the list helped students develop a beginning understanding of how fiction is different from nonfiction.

Mrs. B extended the lesson to incorporate engineering practices (K2-ETS1) into the exploration by challenging students to make their own instruments. As they did so, they needed to identify the source of the vibrations making the sounds. The *Happy Hedgehog Band* book could have been used earlier in the lesson sequence, before students made their own instruments; or it could have been used later in the sequence, with students referring back to their homemade instruments and comparing them to the instruments the hedgehogs made.

The strategies exemplified in the first-grade case study work at other grade levels as well, to develop the disciplinary core idea of Wave Properties (PS4.A). Below are short snapshots of how waves and literacy strategies can be linked together at other grade levels.

In **fourth grade**, students begin to explore waves in an Earth Science unit by making waves in stream trays to investigate how the amount of energy in the wave affects erosion on a model coastline. The use of a slow-motion smartphone camera allows them to slow down the waves to observe their structure. They learn that waves with more energy have larger amplitudes and cause more erosion. For more information related to this performance expectation, visit the NSTA Earth's System Web page at https://www.cde.ca.gov/ci/sc/cf/appx5.asp#link3 (4-ESS2-1).

They then model waves with long stretched springs and describe the pattern that more energy leads to waves with larger amplitudes and/or shorter wavelengths (more humps). For more information related to this performance expectation, visit the NSTA Waves and Their Applications Web page at https://www.cde.ca.gov/ci/sc/cf/appx5.asp#link4 (4-PS4-1). This leads to questions that can best be answered by text such as "Do waves like light and sound, which are too fast and small to observe firsthand, also have properties like amplitude and wavelength?" After summarizing the patterns seen in the data, students generate a list of questions about how light and sound travel. The questions are used to focus interactions with the text. Through close reading of text, students connect the ideas learned on waves they can see and manipulate to properties of light and sound waves, which they cannot directly observe, like color, pitch, and intensity that vary with wavelength and amplitude.

An informal STEM organization visits the class for several sessions to teach the students how to build and program Lego Mindstorms robots. Students learn to connect a sound sensor and program the robot's computer "brain" to respond to sounds above a certain volume. The robot can react in the way that students choose when they clap hands or whistle loudly. They also attach a light sensor that can distinguish the amount of light reflected off an object and program the robot to respond to the intensity of light to stop at a dark line or choose between two differently colored objects.

The students now have had enough experience to make text readings on the ear and eye and how they send information to the brain interesting and meaningful. They can also extend their learning by programming the robot to detect ultrasound and read about echolocation in animals like bats and dolphins. Students compare and contrast how animal senses work with the function of the robot that they learned to program. For more information related to this performance expectation, visit the NSTA Waves and Their Applications Webs page at https://www.cde.ca.gov/ci/sc/cf/appx5.asp#link5 (4-PS4-2) and

https://www.cde.ca.gov/ci/sc/cf/appx5.asp#link6 (4-LS1-2). The readings are used to answer the question "How do animal senses compare to the sensors of our robots?"

In **eighth grade**, learning about waves continues as students take a field trip to a local hospital and learn about the many ways that waves are used to help diagnose patients. Students observe ultrasound, X-rays, MRI, and CAT scans.

Back in class they revisit spring waves and begin to describe them mathematically. For more information related to this performance expectation, visit the NSTA Waves and Their Applications Web page at https://www.cde.ca.gov/ci/sc/cf/appx5.asp#link7 (MS-PS4-1). They are challenged to use the smartphone app Anechoic to design a process to visualize an object hidden behind a fabric screen using sound waves. In doing so, they need to consider the way that the sound waves interact with the various materials. For more information related to this performance expectation, visit the NSTA Waves and Their Applications Web page at https://www.cde.ca.gov/ci/sc/cf/appx5.asp#link8 (MS-PS4-2). They also learn some simple coding changes in the Python language that lets them visualize their data in many different ways to look for patterns. They will revisit this idea when exploring how telescopes work during the astronomy unit later in the year.

Students are asked to generate a list of questions about how information is sent by coding. This is followed by reading on how information can be digitized and transmitted, which they will relate to their own design and method of visualization. For more information related to this performance expectation, visit the NSTA Waves and Their Applications Web page at https://www.cde.ca.gov/ci/sc/cf/appx5.asp#link9 (MS-PS4-3).

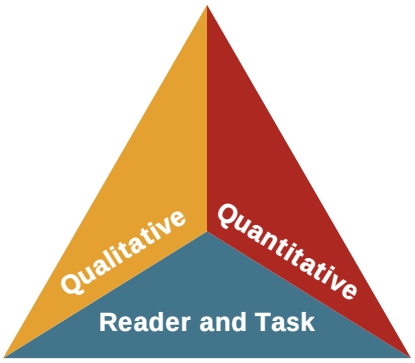
In **high school** the students revisit the properties of waves as part of an Earth Science unit on Earth's systems. For more information related to this performance expectation, visit the NSTA Earth and Human Activity Web page at https://www.cde.ca.gov/ci/sc/cf/appx5.asp#link10 (HS-ESS3-6) and the NSTA Earth's Systems Web page at https://www.cde.ca.gov/ci/sc/cf/appx5.asp#link11 (HS-ESS2-2). Because much of the data that scientists use to understand interacting Earth systems comes from satellite data based on different electromagnetic waves, the students choose a type of data and do a research project to learn about a specific technology and how it works.

Teams of students work to answer the question about how waves are used in technologies that benefit society. The students are asked to develop a class list of possible questions to research. Students select a question or questions to investigate with a group of two to four other students. They use the Internet to find sources of information, evaluate them for reliability, and synthesize information from multiple sources to describe how the technology works to study things like ocean temperature, ground water movement, vegetation patterns,

and weather patterns. Students may need guidance on locating and evaluating online resources; science teachers should collaborate with the teacher librarian to teach these subscription databases. For more information related to this performance expectation, visit the NSTA Waves and Their Applications Web pages at https://www.cde.ca.gov/ci/sc/cf/appx5.asp#link12 (HS-PS4-5) and https://www.cde.ca.gov/ci/sc/cf/appx5.asp#link13 (HS-PS4-4).

Finding Appropriate Science-Related Texts

The California Department of Education Web site Recommended Literature: Prekindergarten Through Grade Twelve (https://www.cde.ca.gov/ci/sc/cf/appx5.asp#link14) is a searchable database of books to help students, teachers, and families find books that entertain, inform, and explore new ideas, cultures, and experiences. Some of the search categories that can be used for selection include the author, title, illustrator or translation; grade-level span; language of a book if other than English or if the title is bilingual; cultural designations; genre; classification; curriculum connections; awards; and discipline and topics or areas of focus within an academic discipline.



While finding appropriate science-related texts, it is also valuable to use the three-part model explained below for determining how easy or difficult a particular text is to read as well as grade-by-grade specifications for increasing text complexity in successive years of schooling. As signaled by the graphic at right, the California Common Core State Standards for English Language Arts/Literacy (CA CCSS for ELA/literacy) model of text complexity consists of three equally important parts:

1. **Qualitative dimensions of text complexity.** In the CA CCSS for ELA/Literacy, *qualitative dimensions* and *qualitative factors* refer to those aspects of text complexity best measured or only measurable by an attentive human reader, such as levels of meaning or purpose; structure; language conventionality and clarity; and knowledge demands.
2. **Quantitative dimensions of text complexity.** The terms *quantitative dimensions* and *quantitative factors* refer to those aspects of text complexity such as word length or frequency, sentence length, and text cohesion that are difficult if not impossible for a human reader to evaluate efficiently, especially in long texts, and are thus today typically measured by computer software.

3. **Reader and task considerations.** While the prior two elements of the model focus on the inherent complexity of text, variables specific to particular readers (such as motivation, knowledge, and experiences) and to particular tasks (such as purpose and the complexity of the task assigned and the questions posed) must also be considered when determining whether a text is appropriate for a given student. Such assessments are best made by teachers using their professional judgment, experience, and knowledge of their students and the subject. The CA CCSS for ELA/Literacy presume that all three elements will come into play when text complexity and appropriateness are determined.

Literature used in a school is determined by the district. Each district should have a selection policy (see the CDE District Selection Policies Web page at https://www.cde.ca.gov/ci/sc/cf/appx5.asp#link15) that explains the procedures it uses for selecting literature that reflects the school's education mission, program, and the ages and interests of its students. The selection policy should describe the process for reconsidering the use of a title.

The Recommended Literature Web site includes a searchable database across all content areas. For example, when searching the database for a particular topic, the search algorithm will search all the content areas returning a list of books associated not only with the English literature database but also the Visual Arts database, etc. This allows suggesting connections across content areas as addressed by the CA CCSS and the CA NGSS. Also, each book has an annotation that explains what the book is about. The annotation can help educators decide if the title is interesting and appropriate to read.

The titles included in the database were reviewed according to the following criteria:

- Reader appeal
- Quality of literature
- Quality of illustrations/photographs and placement
- Quality of translation or available in a language other than English
- Subject-matter content
- Accuracy of content—especially non-fiction
- Trade books—easily available everywhere
- Publisher reputation
- Authority/author reputation
- Notable award received by the author of the book

Below is an example of returned database searches for a given query. The returned search table includes title of the book, annotation, author, discipline, and copyright year.

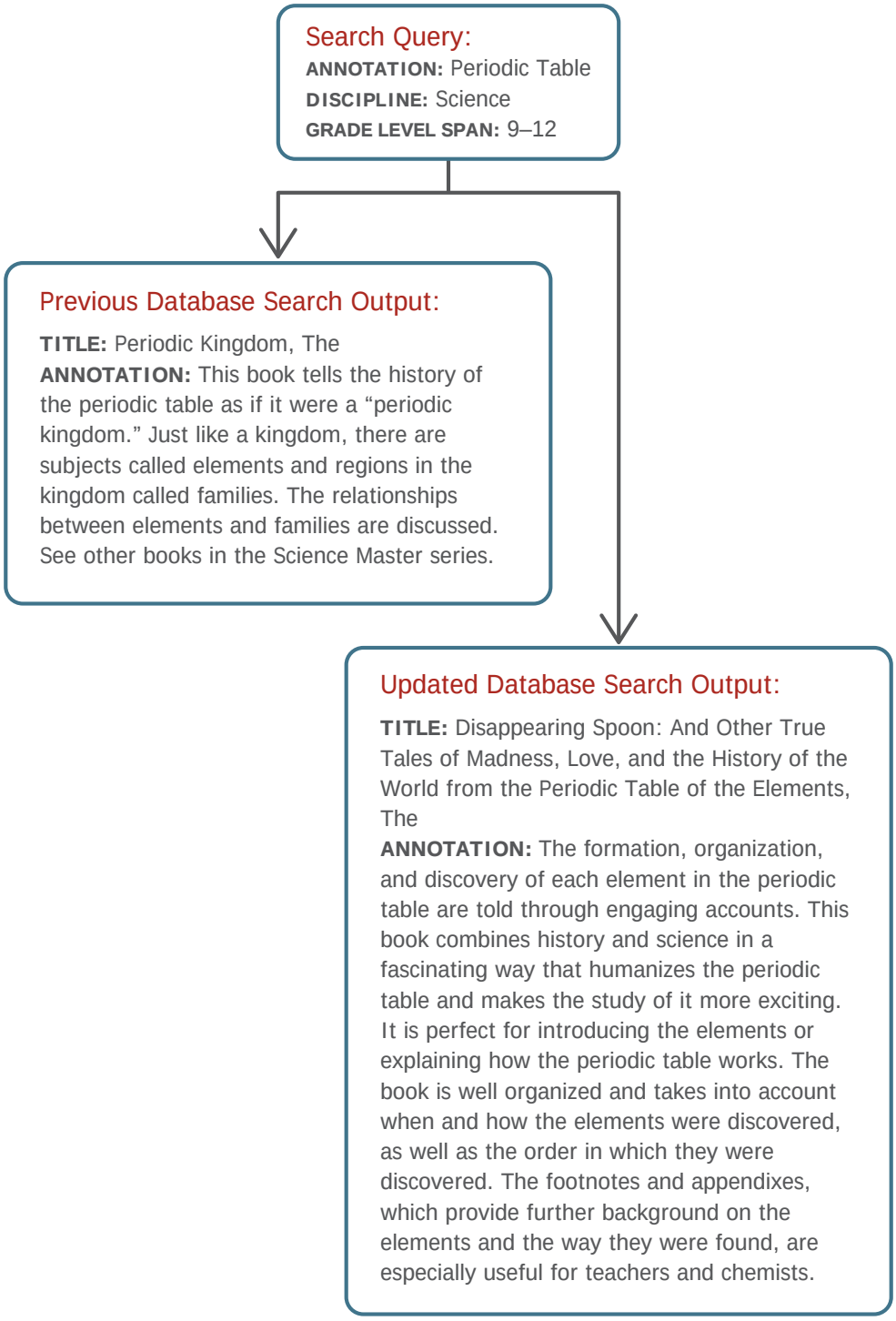
Search query:

Discipline: English-Language Arts General; History—Social Science; Science

Annotation: Botany

TITLE	ANNOTATION	AUTHOR	DISCIPLINE	COPYRIGHT
First Peas to the Table: How Thomas Jefferson Inspired a School Garden	A shiny nickel with Thomas Jefferson's picture on the front, "Sweet Victory" seeds, and bells on the trellis are Maya's good luck charms for the great pea race. Who will be the first to grow, harvest, and fill a bowl with shelled peas that are ready to eat? It is spring, and the students gain valuable lessons, both factual and fictional, in history, science, notetaking, journaling, botany, observation, and life in this title. The book is enhanced with pencil-and-watercolor artwork.	Susan Grigsby	• English Language Arts/ General • History—Social Science • Science	2012

A change to the previous version of the database is the way in which annotations are provided. Past annotations provided a synopsis of the recommended books, whereas the current database includes disciplinary categories for mathematics and science and includes suggestions about how to use the books in the classroom. An example of the outcome of this revision is shown below:



Entries with a copyright of 2003 and newer include these changes. Previously recommended titles will not reflect the new additions. The searchable database may return titles of books that are out of print. In addition to books, students in the science classroom should engage in reading and analyzing text from short or long articles, as well as from both formal and informal sources (see this framework's Resource section for possible online resources.)

Table app 5.1 provides a few examples per grade span of informational and literary texts that have strong links to the CA NGSS and the framework example units. In some cases, both the informational and literary texts are given as examples for the same topic. Teachers can use both texts to provide an analysis of how different literary genres can address the same topic or to provide a platform for collaboration among teachers in different disciplines.

Table app 5.2 includes the available literature from the California Education and the Environment Initiative Curriculum. These informational texts can be downloaded free of charge at the California Education and the Environment Initiative Web site at https://www.cde.ca.gov/ci/sc/cf/appx5.asp#link16.

Table app 5.3 includes a variety of books that Deborah Farmer Kris discussed in a Mind Shift article on KQED (https://www.cde.ca.gov/ci/sc/cf/appx5.asp#link17). She stated that Lisa Brennan, (a middle grades librarian at St. Christopher's School in Virginia), Maggie Knapp (head middle and upper grades librarian at Trinity Valley School), and Brooke Williams (a former children's librarian at New Haven Free Public Library) contributed titles located on this table and that these books support student motivation for learning science. These resources cover famous scientists' personal and intellectual struggles.

Table App 5.1. Suggested Examples of Informational Texts and Literature in Grades K–12

TITLE	ANNOTATION	AUTHOR	COPYRIGHT
Rachel Carson: Pioneer of Ecology	Grade span: K–2 CA NGSS: LS2.A: Ecology and Interdependent Relationships in Ecosystems; science practices Text type: Informational, biography.	Kathleen V. Kudlinski	1989
Sheep in a Jeep	Grade span: K–2 CA NGSS: PS2.A: Forces and Motion and PS3.C Relationship between Energy and Forces. Text type: Literature, fiction.	Nancy Shaw	1986

TITLE	ANNOTATION	AUTHOR	COPYRIGHT
Be a Friend to Trees	Grade span: K–2 CA NGSS: ESS3.A Natural resources; ESS3.C Human impacts on Earth systems; and LS2.A Interdependent relationship in ecosystems. Text type: Informational, nonfiction.	Patricia Lauber	1994
Our Tree Named Steve	Grade span: K–2 CA NGSS: ESS3.A Natural resources; ESS3.C Human impacts on Earth systems and LS2.A Interdependent relationship in ecosystems. Text type: Literature, narrative.	Alan Zweibel	2007
Amigo	Grade span: K–2 CA NGSS: LS1.C Organization of matter and energy flow in organisms. Text type: Literature, narrative.	Byrd Baylor	1989
The Cloud Book	Grade span: K–2 CA NGSS: ESS2-1 Text type: Literature.	Tomie dePaola	1984
Chickens Aren't the Only Ones	Grade span: K–2. CA NGSS: LS3.A Inheritance of traits and LS3.B: variations of traits. Text type: Informational.	Ruth Heller	1999
Penguin Chick	Grade span: K–2. CA NGSS: LS3.A Inheritance of traits and LS3.B: variations of traits. Text type: Informational.	Betty Tatham	2001

TITLE	ANNOTATION	AUTHOR	COPYRIGHT
About Marsupials: A Guide for Children	Grade span: K–2. CA NGSS: LS1.A Structure and function. Text type: Informational.	Cathryn P. Sill	2006
Marsupial Sue	Grade span: K–2. CA NGSS: LS1.A Structure and function. Text type: Literary, fiction.	John Litgow	2011
What Makes a Shadow?	Grade span: K–2. CA NGSS: PS4.B: Electromagnetic radiation. Text type: Informational.	Clyde Robert Bulla	1994
The Very Quiet Cricket	Grade span: K–2. CA NGSS: PS4.A: Wave properties. Text type: Literary, fiction.	Eric Carle	1997
Birdsongs	Grade span: K–2. CA NGSS: PS4.A: Wave properties. Text type: Literary.	Betsy Franco	2007
Cactus Hotel	Grade span: K–2. CA NGSS: LS2.A: Interdependent relationships in ecosystems. Text type: Informational.	Brenda Guiberson	1993
Desert Giant	Grade span: K–2. CA NGSS: LS2.A: Interdependent relationships in ecosystems and LS4.D: Biodiversity and humans. Text type: Informational.	Barbara Bash	2002
Where Once There Was a Wood	Grade span: K–2. CA NGSS: LS4.D: Biodiversity and humans. Text type: Informational.	Denise Fleming	2000

TITLE	ANNOTATION	AUTHOR	COPYRIGHT
Lives of the Scientists: Experiments, Explosions (and What the Neighbors Thought)	Grade span: 3–5. CA NGSS: Science and engineering practices; Nature of Science Text type: Informational.	Kathleen Krull	2013
Here's What You Do When You Can't Find Your Shoe (Ingenious Inventions for Pesky Problems)	Grade span: 3–5. CA NGSS: ETS.2: Influence of Engineering, Technology, and Science on Society and the Natural World. Text type: Informational.	Perry Atheneum	2003
The Boy Who Harnessed the Wind	Grade span: 3–5. CA NGSS: ETS.2: Influence of Engineering, Technology, and Science on Society and the Natural World. Text type: Informational.	Kamkwamba and Bryan Mealer	2013
Girls Think of Everything: Stories of Ingenious Inventions by Women	Grade span: 3–5. CA NGSS: ETS.2: Influence of Engineering, Technology, and Science on Society and the Natural World. Text type: Informational.	Catherine Thimmesh	2000
Rice is Life	Grade span: 3–5. CA NGSS: LS1.C: Organization for matter and energy flow in organisms; LS2.C: Ecosystem dynamics, functioning, and resilience. Text type: Informational.	Rita Golden German	2000
If You Find a Rock	Grade span: 3–5. CA NGSS: ESS2.A Earth materials and systems. Text type: Informational.	Peggy Christian	2008

TITLE	ANNOTATION	AUTHOR	COPYRIGHT
Energy Makes Things Happen	Grade span: 3–5. CA NGSS: PS3.B: Conservation of Energy and Energy Transfer. Text type: Informational.	Kimberly Bradley	2002
Energy Island	Grade span: 3–5. CA NGSS: PS3.B: Conservation of Energy and Energy Transfer; ETS.2: Influence of Engineering, Technology, and Science on Society and the Natural World. Text type: Informational.	Allan Drummond	2015
Switch On, Switch Off	Grade span: 3–5. CA NGSS: PS2.B: Types of Interactions. Text type: Informational.	Melvin Berger	2001
What Magnets Can Do	Grade span: 3–5. CA NGSS: PS1.A Structure and properties of materials. Text type: Informational.	Allan Fowler	1995
The Magnetic Dog	Grade span: 3–5. CA NGSS: PS1.A Structure and properties of materials Text type: Literary.	Bruce Whatley	2001
Water Dance	Grade span: 3–5. CA NGSS: ESS2.C: Roles of water in Earth's surface processes. Text type: Literary.	Thomas Locker	2002
The Big Wave	Grade span: 6–8. CA NGSS: ESS3.A: Natural hazards. Text type: Literary.	Pearl Sydenstricker Buck	1986
The Bald Eagle Returns	Grade span: 6–8. CA NGSS: LS2.C: Ecosystem dynamics, functioning, and resilience. Text type: Informational.	Dorothy H. Patent	2000

TITLE	ANNOTATION	AUTHOR	COPYRIGHT
Rocket Boys	Grade span: 6–8. CA NGSS: PS1: PS2.A: Forces and Motion; ETS1: Interdependence of Science, Engineering, and Technology. Text type: Informational.	Homer Hickam	2000
Flush	Grade span: 6–8. CA NGSS: ESS3.C: Human impacts on Earth systems. Text type: Literary.	Carl Hiaasen	2010
Scat	Grade span: 6–8. CA NGSS: ESS3.C: Human impacts on Earth systems. Text type: Literary.	Carl Hiaasen	2012
Hatchet	Grade span: 6–8. CA NGSS: ESS3.A Natural resources. Text type: Literary.	Gary Paulsen	2006
My Side of the Mountain	Grade span: 6–8. CA NGSS: ESS3.C: Human impacts on Earth systems. Text type: Literary.	Jean Craighead George	2004
Julie of the Wolves	Grade span: 6–8. CA NGSS: ESS3.C: Human impacts on Earth systems. Text type: Literary.	Jean Craighead George	2003
Island of the Blue Dolphins	Grade span: 6–8. CA NGSS: LS2.A: Interdependent relationships in ecosystems; LS2.C: Ecosystem dynamics, functioning, and resilience. Text type: Literary.	Scott O'Dell	2010
The Weirdo	Grade span: 6–8. CA NGSS: ESS3.C: Human impacts on Earth systems. Text type: Literary.	Theodore Taylor	2006

TITLE	ANNOTATION	AUTHOR	COPYRIGHT
Fever 1793	Grade span: 6–8. CA NGSS: LS1.A: Structure and function. Text type: Literary.	Laurie Halse Anderson	2002
The Silent Spillbills	Grade span: 6–8. CA NGSS: ETS2: Interdependence of Science, Engineering, and Technology. Text type: Literary.	Tor Seidler	1998
Asteroid Impact	Grade span: 6–8. CA NGSS: ESS1.B: Earth and the solar system. Text type: Informational.	Douglas Henderson	2000
The Disappearing Spoon: And Other True Tales of Madness, Love, and the History of the World from the Periodic Table of the Elements	Grade span: High School, Chemistry CA NGSS: PS1.A: structure of matter; PS2.B: Chemical reactions. Text type: Literary.	Sam Kean	2010
Periodic Tales: A Cultural History of the Elements, from Arsenic to Zinc	Grade span: High School, Chemistry CA NGSS: PS1.A: structure of matter; PS2.B: Chemical reactions. Text type: Literary.	Hugh Andersey-Williams	2012
To Explain the World: The Discovery of Modern Science	Grade span: High School, Chemistry and Physics. CA NGSS: PS2.B: types of interactions; ETS2: Interdependence of Science, Engineering, and Technology; Nature of Science Text type: Literary.	Steven Weinberg	2015

TITLE	ANNOTATION	AUTHOR	COPYRIGHT
A Universe From Nothing: Why There is Something Rather Than Nothing	Grade span: High School, Chemistry and Physics. CA NGSS: PS1.A: structure of matter; PS2.B: types of interactions. Text type: Informational.	Lawrence M. Krauss	2010
The Violinist's Thumb: And Other Lost Tales of Love, War, and Genius, as Written by Our Genetic Code	Grade span: High School, Life Science CA NGSS: LS3.A: Inheritance of traits; LS3.B: variation of traits. Text type: Literary.	Sam Kean	2012
The Flight of the Iguana	Grade span: High School, Life Science CA NGSS: LS2.A: interdependent relationships in ecosystems; LS4.C: Adaptation; LS4.D: Biodiversity and humans. Text type: Literary.	David Quammen	1998
Night Comes the Cumberlands: A Biography of a Depressed Area	Grade span: High School, Life Science CA NGSS: ESS3.A Natural resources; ESS3.C: Human impacts on Earth systems; ETS2: Interdependence of Science, Engineering, and Technology Text type: Literary.	Hatty M. Caudill and James K. Caudill	2001
Darwin's Armada: Four Voyages and the Battle for the Theory of Evolution	Grade span: High School, Life Science CA NGSS: LS4.A: Evidence of common ancestry and diversity; Nature of Science. Text type: Literary.	Iain McCalman	2010
The Silent Spring	Grade span: High School, Life Science CA NGSS: LS4.D Biodiversity and humans; ESS3.C: Human impacts on Earth systems. Text type: Literary.	Rachel Carson	1962

TITLE	ANNOTATION	AUTHOR	COPYRIGHT
Invention by Design: How Engineers Get From Thought to Thing	Grade span: High School, Engineering CA NGSS: ETS2: Interdependence of Science, Engineering, and Technology Text type: Informational.	Henry Pertoski	1996
Assembling California	Grade span: High School, Earth Science CA NGSS: ESS1.C: History of planet Earth. Text type: Informational, narrative.	John McPhee	1993

Table App 5.2. Recommended Literature from the California Education and the Environment Initiative for Grades K–12

(Note: copyright year is 2010 for all the texts).

TITLE	DISCIPLINARY CORE IDEA (DCI) STRAND
The World Around Me	Grade level: Kindergarten. CA NGSS: LS1.C: Organization of matter and energy flow in organisms. Text type: Informational.
A Day in My Life	Grade level: Kindergarten. CA NGSS: ESS2.E: Biogeology; ESS3.A: Natural resources; ESS3.C: Human impacts on Earth systems. Text type: Informational.
Beavers and Where They Live	Grade level: First Grade CA NGSS: LS1.A: Structure and function. Text type: Informational.
An Interesting Little Bird	Grade level: First Grade CA NGSS: ETS1: Engineering design. Text type: Informational.
Life on California's Channel Islands	Grade level: First Grade LS1.A: Structure and function; ETS1: Engineering design. Text type: Informational.

TITLE	DISCIPLINARY CORE IDEA (DCI) STRAND
The Tall Pine and the Big Eagle	Grade level: First Grade CA NGSS: LS2.A: Interdependent relationships in ecosystems. Text type: Informational.
Adapted to Woodlands	Grade level: Second Grade CA NGSS: LS2.A: Interdependent relationships in ecosystems; LS4.D: Biodiversity and humans. Text type: Informational.
Mother Orange Tree	Grade level: Second Grade CA NGSS: LS2.A: Interdependent relationships in ecosystems. Text type: Informational.
Sarah's Spring	Grade level: Second Grade CA NGSS: ETS1: Engineering design. Text type: Informational.
Roots and Trunks, Beaks and Claws	Grade level: Third Grade CA NGSS: LS3.A: Inheritance of traits; LS3.B: Variation of traits. Text type: Informational.
Sweetwater Marsh National Wildlife Refuge	Grade level: Third Grade CA NGSS: LS2.C: Ecosystem dynamics, functioning, and resilience; LS4.C: Adaptation; LS4.D: Biodiversity and humans; ETS1: Engineering design. Text type: Informational.
California's Natural Regions	Grade level: Third Grade LS3.A: Inheritance of traits; LS3.B: Variation of traits. Text type: Informational.
California's Green Gold	Grade level: Fourth Grade CA NGSS: LS1.A: Structure and function. Text type: Informational.
The Mysterious Humboldt Squid	Grade level: Fifth Grade CA NGSS: LS2.A: Interdependent relationships in ecosystems; LS2.B: Cycles of matter and energy transfer in ecosystems. Text type: Informational.

TITLE	DISCIPLINARY CORE IDEA (DCI) STRAND
Wonderful Compost	Grade level: Fifth Grade CA NGSS: LS2.A: Interdependent relationships in ecosystems; LS2.B: Cycles of matter and energy transfer in ecosystems. Text type: Informational.
San Francisco Sourdough	Grade level: Fifth Grade CA NGSS: LS2.A: Interdependent relationships in ecosystems; LS2.B: Cycles of matter and energy transfer in ecosystems. Text type: Informational.
Water to Grow a City	Grade span: Fifth Grade and 6–8 CA NGSS: ESS2.A: Earth's materials and systems; ESS2.C: The roles of water in Earth's surface processes; ESS3.A: Natural resources; ESS3.C: Human impacts on Earth systems; ETS1: Engineering design. Text type: Informational.
Salt Farming on San Francisco Bay	Grade span: Fifth Grade and 6–8 CA NGSS: ESS2.A: Earth's materials and systems; ESS2.C: The roles of water in Earth's surface processes; ESS3.C: Human impacts on Earth systems. Text type: Informational.
The Sierra Snowpack	Grade span: Fifth Grade and 6–8 CA NGSS: ESS2.A: Earth's materials and systems; ESS2.C: The roles of water in Earth's surface processes; ESS3.A: Natural resources; ESS3.C: Human impacts on Earth systems; ETS1: Engineering design. Text type: Informational.
California Drought	Grade span: Fifth Grade and 6–8 CA NGSS: ESS2.A: Earth's materials and systems; ESS2.C: The roles of water in Earth's surface processes; ESS3.C: Human impacts on Earth systems. Text type: Informational.
The Sacramento–San Joaquin River Delta	Grade span: Fifth Grade and 6–8 CA NGSS: ESS2.A: Earth's materials and systems; ESS2.C: The roles of water in Earth's surface processes; ESS3.C: Human impacts on Earth systems. Text type: Informational.

TITLE	DISCIPLINARY CORE IDEA (DCI) STRAND
Where are the Wolverines?	Grade span: 6–8 CA NGSS: LS4.C: Adaptation; ESS3.C: Human impacts on Earth systems. Text type: Informational.
A Pig's Tale	Grade span: 6–8 CA NGSS: LS4.C: Adaptation; ESS3.C: Human impacts on Earth systems. Text type: Informational.
Powered by Electricity	Grade span: 6–8 CA NGSS: PS3.B: Conservation of energy and energy transfer; ESS3.C: Human impacts on Earth systems; ETS1: Engineering design. Text type: Informational.
As Good As Gold	Grade span: 6–8 CA NGSS: MS-ESS3.C Text type: Informational.
A Surfboard Story	Grade span: 6–8 CA NGSS: PS1.B: Chemical reactions; ESS3.A: Natural resources. Text type: Informational.
Pupfish	Grade span: 6–8 CA NGSS: LS4.C: Adaptation; ESS3.C: Human impacts on Earth systems. Text type: Informational.
The Coyote Success Story	Grade span: 6–8 CA NGSS: LS4.C: Adaptation; ESS3.C: Human impacts on Earth systems. Text type: Informational.
Puzzle in the "Tar" Pits Pieces of a Puzzle	Grade span: 6–8 CA NGSS: ESS3.C: Human impacts on Earth systems. Text type: Informational.
Rice Pharming in California	Grade span: High School, Life Science CA NGSS: LS2.C: Ecosystem dynamics, functioning, and resilience; LS4.D: Biodiversity and humans; LS3.B: Variation of traits; LS4.D: Biodiversity and humans. Text type: Informational.

TITLE	DISCIPLINARY CORE IDEA (DCI) STRAND
Biological Riches and Rarities	Grade span: High School, Life Science CA NGSS: LS2.B: Cycles of matter and energy transfer in ecosystems; LS4.D: Biodiversity and humans. Text type: Informational.
The Transformation of Our Native Grasslands	Grade span: High School, Life Science CA NGSS: LS2.C: Ecosystem dynamics, functioning, and resilience; LS4.D: Biodiversity and humans. Text type: Informational.
A Second Chance for Sea Otters	Grade span: High School, Life Science CA NGSS: LS2.C: Ecosystem dynamics, functioning, and resilience; LS4.D: Biodiversity and humans. Text type: Informational.
Coastal Wetlands, Treasures of Diversity	Grade span: High School, Life Science CA NGSS: LS2.B: Cycles of matter and energy transfer in ecosystems; LS4.D: Biodiversity and humans. Text type: Informational.
The Channel Islands—The Galapagos of California	Grade span: High School, Life Science LS2.B: Cycles of matter and energy transfer in ecosystems; LS4.B: Natural selection; LS4.C: Adaptation; LS4.D: Biodiversity and humans. Text type: Informational.
Climate Change in the Golden State	Grade span: High School, Earth Science CA NGSS: ESS2.D: Weather and climate; ESS3.C: Human impacts on Earth systems; ESS3.D: Global climate change. Text type: Informational.
Packed Like a Can of Sardines	Grade span: High School, Earth Science CA NGSS: ESS3.A: Natural resources. Text type: Informational.
The California Desert Protection Act—A National Success	Grade span: High School, Earth Science CA NGSS: ESS2.E: Biogeology. Text type: Informational.
The Promise of Biofuels: Hype or a Real Solution?	Grade span: High School, Earth Science CA NGSS: ETS1: Engineering design; ETS2: Interdependence of Science, Engineering, and Technology. Text type: Informational.

TITLE	DISCIPLINARY CORE IDEA (DCI) STRAND
Don't Forget Your Sunscreen!	Grade span: High School, Earth Science CA NGSS: ESS2.D: Global climate change. Text type: Informational.
Taking Charge of the Bay-Delta	Grade span: High School, Earth Science CA NGSS: ESS2.C: The roles of water in Earth's surface processes. ETS1: Engineering design; ETS2: Interdependence of Science, Engineering, and Technology Text type: Informational.

Table App 5.3. Resources About Famous Scientists' Personal and Intellectual Struggles to Support Student Motivation

TITLE	AUTHOR	COPYRIGHT
Ada Byron Lovelace and the Thinking Machine	Laurie Wallmark and April Chu	2015
Rachel Carson and Her Book That Changed the World	Laurie Lawler and Laura Beingessner	2014
On a Beam of Light	Jennifer Berne and Vladimir Radunsky	2013
Snowflake Bentley	Jacqueline Briggs Martin and Mary Azarian	2009
The Tree Lady: The True Story of How One Tree-Loving Woman Changed a City Forever	H. Joseph Hopkins and Jill McElmurry	2013
Summer Birds: The Butterflies of Maria Merian	Margarita Engle and Julie Paschkis	2010
Life in the Ocean: The Story of Oceanographer Sylvia Earle	Claire A. Nivola	2012
My Brief History	Stephen Hawking	2013
Feynman (Richard Feynman, physicist)	Jim Ottaviani and Leland Myrick	2013
Primates: The Fearless Science of Jane Goodall, Dian Fossey, and Biruté Galdikas	Jim Ottaviani and Maris Wicks	2015
Breakthrough! How Three People Saved "Blue Babies" and Changed Medicine Forever	Jim Murphy	2015

TITLE	AUTHOR	COPYRIGHT
What Color is My World? The Lost History of African-American Inventors	Kareem Abdul-Jabbar and Raymond Obstfeld	2013
Headstrong: 52 Women Who Changed Science—and the World	Rachel Swaby	2015
Brilliant Blunders: From Darwin to Einstein—Colossal Mistakes by Great Scientists That Changed Our Understanding of Life and the Universe	Mario Livio	2014
Even Einstein Struggled: Effects of Learning About Great Scientists' Struggles on High School Students' Motivation to Learn Science	Xiaodong Lin-Siegler (Et. Al)	Journal of Educational Psychology 2016, Vol. 108, No. 3, 314 –328

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