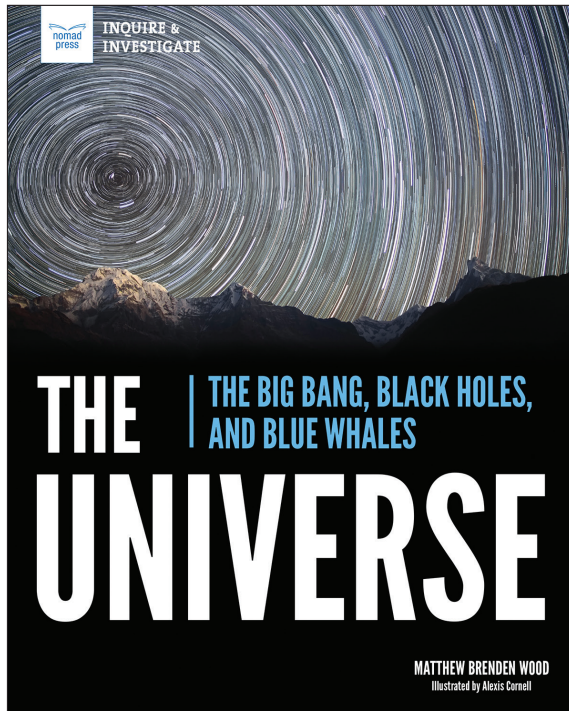




The Universe: The Big Bang, Black Holes, and Blue Whales

Nomad Press offers concise classroom guides to help educators explore content-related topics with students and encourage them to develop ideas in meaningful ways. Includes Essential Questions and Common Core Connections.

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Age: 12–15
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Specs: 8 x 10, 128 pages, color interior
Focus: Science & Nature / Space Science
GRL: Z+

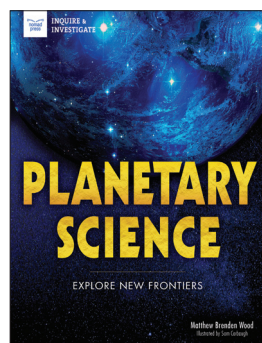
What exactly is the universe? How did it begin? How will it end?

Explore these questions and more in *The Universe: The Big Bang, Black Holes, and Blue Whales*. Readers ages 12 to 15 embark on an exciting journey that starts with the Big Bang and takes them all the way to the end of the universe, with many exciting stops in between. Take a look billions of years into the past and discover the mind-bending early moments of the universe, the rise of the first stars, and the formation of the earliest galaxies. Explore the birth of our sun and solar system and the formation of the only place in the universe known to support life: the earth. Finally, zoom billions of years into the future to learn about the death of the sun, a colossal collision of galaxies, and even the fate of the universe itself.

The Universe includes hands-on STEM projects that encourage critical and creative thinking skills, along with graphic novel–style illustrations, amazing photography from NASA, and links to online resources.

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ESSENTIAL QUESTIONS TO ASK

KEY VOCABULARY

abiogenesis, antimatter, Big Bang, cosmology, cyanobacteria, dark matter, infinite, symbiotic, unprecedented

BEFORE READING

1 Establish Background Knowledge

- What are some widely held theories that were debunked in your time? What was the process like?
- Is it important to know the origins of the universe? Why or why not?
- Why is it sometimes hard to change people's minds, even when there is proof?

2 Skill Introduction

- What do you do when you come to a word or phrase you do not know?
- How do photographs, videos, and maps help someone learn about a topic?

CCC: CCSS.ELA-Literacy.L.9-10.4b Identify and correctly use patterns of word changes that indicate different meanings or parts of speech (e.g., analyze, analysis, analytical; advocate, advocacy).

CCC: CCSS.ELA-Literacy.L.9-10.6 Acquire and use accurately general academic and domain-specific words and phrases, sufficient for reading, writing, speaking, and listening at the college and career readiness level; demonstrate independence in gathering vocabulary knowledge when considering a word or phrase important to comprehension or expression.

DURING READING

1 Check for Understanding

- What do you already know about the origins of the universe? The origins of life on Earth?
- How can we use knowledge about how life began to make better choices about our world today?
- Why are there still so many mysteries about the universe?

CCC: CCSS.ELA-Literacy.SL.11-12.3 Evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric, assessing the stance, premises, links among ideas, word choice, points of emphasis, and tone used.

CCC: CCSS.ELA-Literacy.WHST.9-10.8 Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation.



Take a trip to the center of the Milky Way with this simulation from NASA!

www.nasa.gov/mission_pages/chandra/news/galactic-center-visualization-delivers-star-power.html



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ESSENTIAL QUESTIONS TO ASK

AFTER READING

1 Summary and Expansion

- a How do we know that dark matter in the universe exists if we can't see it?
- b Is it difficult to think about events happening on an astronomical timescale rather than a human one? How is this healthy for our brains?
- c What challenges do astronomers and cosmologists face when studying galaxies? What are some solutions they've thought of to overcome these challenges?
- d Why do you think the universe and everything in it play such prominent roles in mythology?
- e Why is it accurate to say that everything we know is the stuff of stars?
- f Why do scientists use color and temperature to classify stars?
- g What are some of the differences between gas planets and rocky planets?
- h What are some planetary characteristics that contributed to life on Earth?

CCC: CCSS.ELA-Literacy.RST.9-10.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text.

CCC: CCSS.ELA-Literacy.SL.11-12.1d Respond thoughtfully to diverse perspectives; synthesize comments, claims, and evidence made on all sides of an issue; resolve contradictions when possible; and determine what additional information or research is required to deepen the investigation or complete the task.

CCC: CCSS.ELA-Literacy.SL.11-12.3 Evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric, assessing the stance, premises, links among ideas, word choice, points of emphasis, and tone used.

CCC: CCSS.ELA-Literacy.WHST.9-10.8 Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation.

COMMON CORE CONNECTIONS

Grade: 9-10 Language CCSS.ELA-Literacy.L.9-10.3,4,4a,4b,4c,4d,5,5a,5a,6

Grade: 9-10 Science & Technical Subjects CCSS.ELA-Literacy.RST.9-10.1,2,3,4,5,6,7,8,9,10

Grade: 11-12 Speaking & Listening CCSS.ELA-Literacy.SL.11-12.1,1a,1d,2,3,4,5,6

Grade: 9-10 Writing HST CCSS.ELA-Literacy.WHST.9-10.1,2,4,6,7,8,9,10



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COMMON CORE CONNECTIONS

Grade: 9-10 Language

CCSS.ELA-Literacy.L.9-10.3,4,4a,4b,4c,4d,5,5a,5a,6

3 Apply knowledge of language to understand how language functions in different contexts, to make effective choices for meaning or style, and to comprehend more fully when reading or listening.

4 Determine or clarify the meaning of unknown and multiple-meaning words and phrases based on grades 9–10 reading and content, choosing flexibly from a range of strategies.

4a Use context (e.g., the overall meaning of a sentence, paragraph, or text; a word's position or function in a sentence) as a clue to the meaning of a word or phrase.

4b Identify and correctly use patterns of word changes that indicate different meanings or parts of speech (e.g., analyze, analysis, analytical; advocate, advocacy).

4c Consult general and specialized reference materials (e.g., dictionaries, glossaries, thesauruses), both print and digital, to find the pronunciation of a word or determine or clarify its precise meaning, its part of speech, or its etymology.

4d Verify the preliminary determination of the meaning of a word or phrase (e.g., by checking the inferred meaning in context or in a dictionary).

5 Demonstrate understanding of figurative language, word relationships, and nuances in word meanings.

5a Interpret figures of speech (e.g., euphemism, oxymoron) in context and analyze their role in the text.

6 Acquire and use accurately general academic and domain-specific words and phrases, sufficient for reading, writing, speaking, and listening at the college and career readiness level; demonstrate independence in gathering vocabulary knowledge when considering a word or phrase important to comprehension or expression.

Grade: 9-10 Science & Technical Subjects

CCSS.ELA-Literacy.RST.9-10.1,2,3,4,5,6,7,8,9,10

1 Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.

2 Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text.

3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text.

4 Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics.

5 Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy).

6 Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address.

7 Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.

8 Assess the extent to which the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem.

9 Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts.

10 By the end of grade 10, read and comprehend science/technical texts in the grades 9–10 text complexity band independently and proficiently.



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COMMON CORE CONNECTIONS

Grade: 11-12 Speaking & Listening

CCSS.ELA-Literacy.SL.11-12.1,1a,1d,2,3,4,5,6

1 Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 11–12 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively.
1a Come to discussions prepared, having read and researched material under study; explicitly draw on that preparation by referring to evidence from texts and other research on the topic or issue to stimulate a thoughtful, well-reasoned exchange of ideas.

1d Respond thoughtfully to diverse perspectives; synthesize comments, claims, and evidence made on all sides of an issue; resolve contradictions when possible; and determine what additional information or research is required to deepen the investigation or complete the task.

2 Integrate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, orally) in order to make informed decisions and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data.

3 Evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric, assessing the stance, premises, links among ideas, word choice, points of emphasis, and tone used.

4 Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks.

5 Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.

6 Adapt speech to a variety of contexts and tasks, demonstrating a command of formal English when indicated or appropriate. (See grades 11–12 Language standards 1 and 3 here for specific expectations.)

Grade: 9-10 Writing HST

CCSS.ELA-Literacy.WHST.9-10.1,2,4,6,7,8,9,10

1 Write arguments focused on discipline-specific content.

2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

6 Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically.

7 Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.

8 Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation.

9 Draw evidence from informational texts to support analysis, reflection, and research.

10 Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.



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ACTIVITY!**Inquire & Investigate****MODEL THE MILKY WAY**

From inside the Milky Way, it's hard to understand its size and shape. But, thanks to the careful measurement of thousands of stars, astronomers have a pretty good idea what the Milky Way would look like if we could see it from the outside. Try constructing a model of the Milky Way.

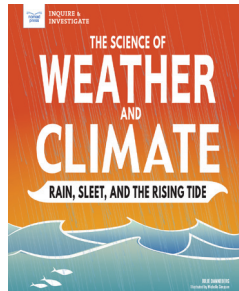
- **Research the Milky Way to understand how to create your model.**
- **Choose any materials and medium you want to make your model.** Make sure you represent the Milky Way's disk, bulge, and spiral arms.
- **Consider these questions as you design your model.**
 - Will the model be two- or three-dimensional?
 - Will it be a physical or computer model?
 - How detailed will you make the model and how will you label it?
 - Will you accurately represent the scale of the Milky Way's disc, bulge, and spiral arms?
 - The Milky Way has several satellite galaxies, including the Large and Small Magellanic Clouds. Can you represent them in your model? What would be the correct size and distance?
- **Assemble your model and adjust it as needed.** Use your model to explain to a friend or classmate the structure of the Milky Way.

To investigate more, consider that astronomers think the Milky Way might be warped like a bent frisbee! How could that affect your model? What would you do differently? Check out this website for more information on the bent frisbee theory!

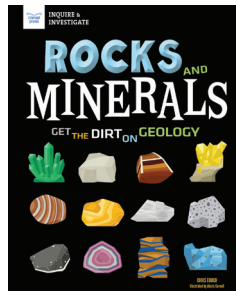


 PBS galaxy warped

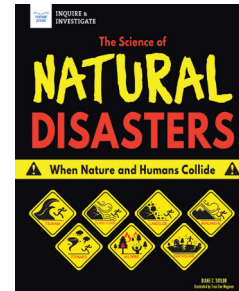
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Author: Carla Mooney



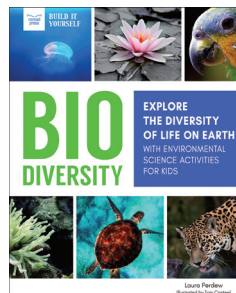
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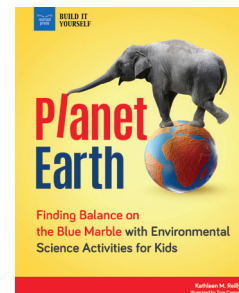
Author: Matthew Brenden Wood



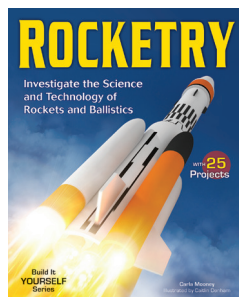
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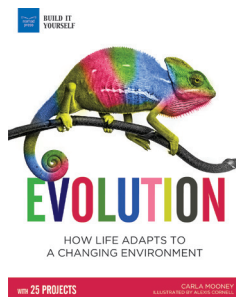
Author: Laura Perdew



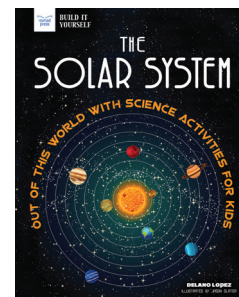
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Author: Karen Bush Gibson



Author: Carla Mooney



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