Readorium Alignment to FOSS Kit: Waves		
Readorium Books By Standard	**Magazine Articles (A) and Science Alive Videos (V) By Standard**	**Teacher Resource Center Classroom Strategy Lessons (CL) with Articles (A) by Standard**
NGSS: MS-PS4: Waves and their applications in technologies for information transfer-How are waves used to transfer energy and information?		
NGSS: MS-PS4.A: Wave properties What are the characteristic properties and behaviors of waves? [A simple wave has a repeating pattern with a specific wavelength, frequency, and amplitude. A sound wave needs a medium through which it is transmitted. Geologists use seismic waves and their reflection at interfaces between layers to prove structures deep in the planet.		
•	• Sounds and Hearing	•
NGSS: MS-PS4.B: Electromagnetic radiation What is light? How can we explain the varied effects that involve light? What other forms of electromagnetic radiation are there? [When light shines on an object, it is reflected, absorbed, or transmitted through the object, depending on the object's material and the frequency (color) of the light. A wave model of light is useful for explaining brightness, color, and the frequency-dependent bending of light at a surface between media (prisms) How ever, because light can travel through space, it cannot be a matter wave, like sound or water waves.]		
• Lights Sound Action • Space Rocks!	• Look, A Rainbow! Where Did That Come From (A) • Cool Beams (A)	•
NGSS: MS-PS4.C: Information technologies and instrumentation How are instruments that transmit and detect waves used to extend human senses? [Appropriately designed technologies 9e.g. radio, television, cell phones, wired and wireless computer networks) make it possible to detect and interpret many types of signals that cannot be sensed directly. Designers of such devices must understand both the signal and its interactions with matter. Many modern communication devices use digitized signals (sent as wave pulses) as a more reliable way to encode and transmit information.]		
• Lights Sound Action • Space Rocks!	• Look, A Rainbow! Where Did That Come From (A) • Cool Beams (A) • Sounds and Hearing	•
NGSS: MS-PS4-1: Use mathematic representations to describe a simple model for waves that includes how the amplitude of a wave is related to the energy in a wave		
•	• Sounds and Hearing	•
NGSS: MS-PS4-2: Develop and use a model to describe that waves are reflected, absorbed, or transmitted through various materials.		
• Lights Sound Action • Space Rocks!	• Look, A Rainbow! Where Did That Come From (A) • Cool Beams (A)	•
NGSS: MS-PS4-3: Integrate qualitative scientific and technical information to support the claim that digitized signals (sent as wave pulses) are a more reliable way to encode and transmit information.		
• Lights Sound Action • Space Rocks!	• Look, A Rainbow! Where Did That Come From (A) • Cool Beams (A) • Sounds and Hearing	•
NGSS: MS-ETS1: Engineering design-how do engineers solve problems?		
NGSS: MS-ETS1.A: Defining and delimiting an engineering problem		

What is a design for? What are the criteria and constraints of a successful solution? [The more precisely and design task's criteria and constraints can be defined, the more likely it is that the designed solution will be successful. Specification of constraints includes consideration of scientific principles and other relevant knowledge that are likely to limit possible solutions (e.g., familiarity with the local climate may rule out certain plants for the school garden).]		
• Artificial Satellites • Character Traits of a Good Scientist • Learning from Natural Disasters • Pollution	• Inventor of the Toughest Stuff (A) • Antlers, Beaks, Geckos and Us (V) • Safe from Tsunamis (V) • An Amazing Teen Scientist (A)	• Context Clues (CL-3 A-1 Things That Go Boom!) • Determining Importance (CL-2, A-1. Dragonflies: Flying Aces)
NGSS: MS-ETS1.B: Developing possible solutions What is the process for developing potential design solutions? [A solution needs to be tested, and then modified on the basis of the rest results, in order to improve it. There are systematic processes for evaluating solutions with respect to how well they meet the criteria and constraints of a problem.		
• Superstition or Science	• Computer's Best Friend(A) • Things That Go BOOM!: The History and Chemistry of Explosives(A) • Crazy Careers in Science(A)•Space psychologist(A) • From Waste to Energy: Bacteria Gives a Boost(V) • Hydrogen Power(V) • Wave of Future-Green Gasoline(V) • Pig Poop & Other Energy Sources(V) • Getting Ready for Earthquakes(V) • Chores Don't Have to be a Pain in the But...ler(V) • Musical Computer(V) • Robots of Your Dreams(V) • Robots with Whiskers(V) • Sensible Sensors(V) • Signing Made Simple(V)•Smart Cars!(V) • The Ins and Outs of the Brain(V) • Strong &Sensitive: Metal Foam(V) • Smart Helicopters(V) • X-Ray Vision: Beyond the Bones(V) • Picking Your Brain(V)•The Creative Brain(V) • The Good, Bad, and Baby(V) • What Makes Us Tick(V) • Locked-in Syndrome: (V) • Nanoparticles: Tiny Glowing Cancer Killers(V) • Tongue Driven (V) • Vision for Blind People-Fact or Fiction(V) • Extreme Bacteria(V) • Lord of the Tree Rings(V) • Coral Corrosion(V) • Disappearing Frogs(V) • Earthworm Invasion(V) • ESP: A Lab in a Can(V) • Flowing Free(V)	• Context Clues (CL-3 A-1 Things That Go Boom!)

	• Virtual Wildfires(V) • Women Powered Robots(V) • Wave of the Future: Clean Ocean Energy(V)	
NGSS: MS-ETS1.C: Optimizing the design solution How can the various proposed design solutions be compared and improved? [There are systematic processes for evaluating solutions with respect to how well they meet the criteria and constraints of a problem. Comparing different designs could involve running them through the same kinds of tests and systematically recording the results to determine which design performs best. Although one design may not perform the best across all tests, identifying the characteristics of the design that performed the best in each test can provide useful information for the redesign process-that is, some of those chraacteristics may be incorporated into the new design. This iterative process of testing the most promising solutions and modifying what is proposed on the basis of the test results leads to greater refinement and ultimately to an optimal solution. Once such a suitable solution is determined, it is important to describe that solution, explain how it was developed, and describe the freature that make it successful.		
• Microscopes • Space Race • Superstition or Science	• Do Scientists Cheat? (A)	•
NGSS: MS-ETS1-1: Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.		
• Artificial Satellites • Character Traits of a Good Scientist • Learning from Natural Disasters • Pollution	• Inventor of the Toughest Stuff (A) • Antlers, Beaks, Geckos and Us (V) • Safe from Tsunamis (V) • An Amazing Teen Scientist (A)	• Context Clues (CL-3 A-1 Things That Go Boom!) • Determining Importance (CL-2, A-1. Dragonflies: Flying Aces)
NGSS: MS-ETS1-2: Evaluate competing design solutions using a systematic process to determine how ell they meet the criteria and constraints of the problem.		
• Superstition or Science	• Computer's Best Friend(A) • Things That Go BOOM!: The History and Chemistry of Explosives(A) • Crazy Careers in Science(A)•Space psychologist(A) • From Waste to Energy: Bacteria Gives a Boost(V) • Hydrogen Power(V) • Wave of Future-Green Gasoline(V) • Pig Poop & Other Energy Sources(V) • Getting Ready for Earthquakes(V) • Chores Don't Have to be a Pain in the But...ler(V) • Musical Computer(V) • Robots of Your Dreams(V) • Robots with Whiskers(V) • Sensible Sensors(V) • Signing Made Simple(V)•Smart Cars!(V) • The Ins and Outs of the Brain(V) • Strong &Sensitive: Metal Foam(V)	• Context Clues (CL-3 A-1 Things That Go Boom!)

	• Smart Helicopters(V) • X-Ray Vision: Beyond the Bones(V) • Picking Your Brain(V)•The Creative Brain(V) • The Good, Bad, and Baby(V) • What Makes Us Tick(V) • Locked-in Syndrome: (V) • Nanoparticles: Tiny Glowing Cancer Killers(V) • Tongue Driven (V) • Vision for Blind People-Fact or Fiction(V) • Extreme Bacteria(V) • Lord of the Tree Rings(V) • Coral Corrosion(V) • Disappearing Frogs(V) • Earthworm Invasion(V) • ESP: A Lab in a Can(V) • Flowing Free(V) • Virtual Wildfires(V) • Women Powered Robots(V) • Wave of the Future: Clean Ocean Energy(V)	
NGSS: MS-ETS1-3: Analyze data from tests to determine similarities and differences among several design solutions to identify the solution to better meet the criteria for success.		
• Microscopes • Space Race • Superstition or Science	• Do Scientists Cheat? (A)	•
NGSS: MS-ETS1-4: Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.		
• Microscopes • Space Race • Scientific Method	•	• Graphic Features (CL-2, A-1 High School Track)