



PHYSICAL: Technology  
**Star Trek  
Tech**

**PRE-READING PROMPTS:**

- If you were making a television show set on a spaceship, what kind of gadgets would you want your crew to have access to? Why?
- What inventions that you use today could have been inspired by a work of science fiction?

**DID YOU KNOW?**

- While the *Starship Enterprise* can travel fast enough to cross solar systems in seconds, we have yet to find a way to go faster than the speed of light, which was first measured in 1676 by Danish astronomer Ole Romer.
- Mae Jemison, the first African-American woman in space, was also the first real astronaut to appear on *Star Trek* in a 1993 television episode of *Star Trek: The Next Generation*.

**CRITICAL THINKING:**

- In the pilot episode of *Star Trek: The Next Generation*, viewers first encountered the “Holodeck,” a simulated 3-D virtual environment facility that creates any environment complete with sounds, smells, people, and objects. While we haven’t come that far, similar “virtual worlds” can be found today on the Internet, in games, and in many other places. What are some virtual worlds you can think of? What are the pros and cons of interacting in a virtual world?

**CROSS-CURRICULAR CONNECTIONS:**

**ART:** Imagine that the producers of *Star Trek* have called you. They tell you that a sequel to their upcoming movie is already in the works and they want you to invent the alien creature that crewmembers will encounter on a newly discovered planet! On a separate sheet of paper, create a colored sketch of your alien. Use one or more of the characteristics of animals described in “Extreme Mammals” (p. 18). Label each part associated with the extreme mammals and describe how your alien uses these features.

**RESOURCES**

- If you’re in the Detroit area between now and September 7, you can stand on the bridge of the U.S.S. *Enterprise*, and see a collection of other sets and props from all of the shows and movies at *Star Trek: The Exhibition*.  
[www.detroitsciencecenter.org/StarTrek.html](http://www.detroitsciencecenter.org/StarTrek.html).
- Read more about the scientific possibilities of the *Star Trek* universe in Lawrence Krauss’s book, *The Physics of Star Trek*, Basic Books, 2007.
- Keep tabs on NASA’s next generation spacecraft:  
[www.nasa.gov/mission\\_pages/constellation/main/index.html](http://www.nasa.gov/mission_pages/constellation/main/index.html).

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EARTH: Renewable Energy  
**Sea Breeze**

**PRE-READING PROMPTS:**

- What are several benefits of renewable energy?
- Can you name three fossil fuels that are used today to produce energy?
- If you could create a new science class for your school, what would it be?

**DID YOU KNOW?**

- The amount of wind power in North Dakota alone is enough to produce more than 35 percent of the electricity used in the lower 48 states. (Unfortunately, transmitting that wind power over large distances is not feasible.)
- Many homeowners are now using small rooftop wind turbines that cost approximately \$10,000 for the turbine and installation to help reduce their home’s electric bills.

**CRITICAL THINKING:**

- There are plans to create an offshore wind farm in the waters around Cape Cod. Residents have split into two factions: one in favor of the wind farm’s creation, and the other strongly opposed to its development. Divide the class into two groups representing each side. After conducting computer research, have both groups present their cases and debate them in class. (A good place to start research is: [www.capecodonline.com/apps/pbcs.dll/section?category=SPECIAL01](http://www.capecodonline.com/apps/pbcs.dll/section?category=SPECIAL01).)

**CROSS-CURRICULAR CONNECTIONS:**

**HISTORY:** The earliest windmills were developed in Persia sometime between 500 and 900 A.D. and have been used around the world through the ages. Research a historical windmill and present your findings to the class. Be sure to include information about the windmill’s design, what it was used for, and any other important historical details. Begin your research by reading this timeline of windmills from the U.S. Department of Energy: [www.eia.doe.gov/kids/history/timelines/wind.html](http://www.eia.doe.gov/kids/history/timelines/wind.html).

**RESOURCES**

- Check out this Web site for students about all aspects of wind energy: [www.kidwind.org/lessons/students.html](http://www.kidwind.org/lessons/students.html).
- Students engineer their own virtual wind turbines, test their efficiency, and get feedback about their design at: [www.tryscience.org/fieldtrips/fieldtrip\\_shockwave.html?omsi\\_windmill](http://www.tryscience.org/fieldtrips/fieldtrip_shockwave.html?omsi_windmill).
- Watch a slide show about renewable energy at the U.S. Department of Energy’s Web site: [http://tonto.eia.doe.gov/energy\\_in\\_brief/slideshows/renewable\\_energy.html](http://tonto.eia.doe.gov/energy_in_brief/slideshows/renewable_energy.html).

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LIFE: Body Systems  
**Revved-Up Athletes**

**PRE-READING PROMPTS:**

- Do you think driving a race car is as physically rigorous as doing some other sports?
- How do you think race-car drivers prepare off-track to get their bodies in shape for upcoming races?
- What are some factors you think may cause race-car drivers to become overheated during the race?

**DID YOU KNOW?**

- The combined area of all four of the car's tires in contact with the racetrack at any moment during the Indy 500 is roughly the size of a piece of notebook paper.
- The Indy 500 public address system that keeps fans informed of the race's progress has 341 loudspeakers, 38 subwoofers, and more than 70 miles of speaker wire—making it the world's largest public address system.
- The average person has approximately 2.6 million sweat glands. The majority of these are eccrine sweat glands that produce sweat. The less numerous apocrine sweat glands form around hair follicles and are the ones responsible for the stench.

**CRITICAL THINKING:**

- In 2007, the Indy 500 went green and became the first motor-sport race to require that drivers run their cars on renewable fuels. Since then, racers like Leilani Münter have been searching for other ways to promote environmentalism on the racecourse. Imagine she has hired you to create a flyer to pass out at this year's Indy 500 about what she is doing to offset her carbon footprint while racing. Get started by checking out her Web site: [www.leilanimunter.com/index2.html](http://www.leilanimunter.com/index2.html). What would you do to help the environment if you were a race-car driver?

**CROSS-CURRICULAR CONNECTIONS:**

**MATH:** The average Indy car uses 1.3 gallons of gas per lap. A driver makes 200 laps in the 500-mile Indy 500 race. How many gallons of gas does the car use per race? The average Indy car has a gas tank that holds 22 gallons. How many pit stops to refill the tank would be needed? Today's family cars average 34 miles per gallon (mpg). How does that compare with the average mpg of an Indy car? (*Answers: 1.3 gallons per lap x 200 laps = 260 gallons of gas; 260 gallons/22 gallons = 11.8 pit stops; 500 miles/260 gallons = 1.9 mpg for the race, or nearly 18 times less efficient than the average family car.*)

**RESOURCES**

- Take a tour of the Formula 1 race cars used in the Indy 500 with this interactive diagram: [http://news.bbc.co.uk/sport2/hi/motorsport/formula\\_one/car\\_guide/default.stm](http://news.bbc.co.uk/sport2/hi/motorsport/formula_one/car_guide/default.stm).
- The Indianapolis 500 takes place on May 24th; find out more at: [www.indy500.com](http://www.indy500.com).



LIFE: Mammals  
**Extreme Mammals**

**PRE-READING PROMPTS:**

- Name several mammals. What characteristics do these animals share?
- What kinds of special features would you be surprised to find on a mammal?
- What can scientists learn by comparing present-day animals with similar prehistoric ones?

**DID YOU KNOW?**

- Pangolins come in all sizes. The smallest species is 1 meter (3.3 feet) long and can be found in Africa and Asia. The Giant Pangolin is 2 meters long (6.6 feet), weighs about 32 kilograms (70.5 pounds), and is mainly found in Uganda, Tanzania, and Kenya.
- Although mammals have many defense techniques, they rarely produce poisons. The egg-laying platypus, with its venom-producing spurs, is one exception. While its sting won't kill you, you'll be really sorry you had the encounter because the pain can last a month in some cases!

**CRITICAL THINKING:**

- Like an anteater, the pangolin has a long, skinny tongue that it uses to capture termites. It makes up for its lack of teeth with very strong stomach acid that breaks down the insects. What do you think are some of the advantages to this method of digestion? Do you think it's better to have teeth or a pangolin-like tongue and digestive system?

**CROSS-CURRICULAR CONNECTIONS:**

**LANGUAGE ARTS:** Have students select an extinct mammal to research. Then ask them to write an acrostic poem about the animal that describes it or tells a story about its life. (Acrostic poems are among the easiest for students to create: When read vertically, the first letter of each line of the poem will form the name of the subject.) See this Web site for some extinct mammals from around the world: <http://museumvictoria.com.au/prehistoric/mammals>.

**RESOURCES**

- Find lesson plans, lists of extinct animals, and more at the Illinois State Museum's Web site about the extinctions of the Late Pleistocene era: [www.museum.state.il.us/exhibits/larson/ice\\_age\\_animals.html](http://www.museum.state.il.us/exhibits/larson/ice_age_animals.html).
- Should we try to bring back extinct mammals or their relatives and "re-wild" North America and Europe? Check out this article and slide show at *Scientific American*: [www.sciam.com/article.cfm?id=bringing-back-europes-prehistoric-beasts](http://www.sciam.com/article.cfm?id=bringing-back-europes-prehistoric-beasts).
- You can purchase this educational video game to build your own zoo using extinct animals: <http://zootycoon.com/Products/ExtinctAnimals>.