Learning A–Z	level **Z**	Multi-level	N/A
Grade	5	Word Count	1,453
Lexile	1080L	Nonfiction • Informational	

Refer to the Focus Question on page 2 of this title to guide discussion and support additional learning connected to the text.

Yes, printers can print letters, but did you know they can also print shoes, buildings, and dinosaur heads? **You Can Print What?** describes the technology behind 3D printing and some of its many creative and useful applications. The book also briefly traces the development of new printing technologies through the ages. Photographs and a timeline support the information. In addition to educating students about new technology, the book can also be used for lessons on main idea and details and inflectional endings.

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Learning A–Z

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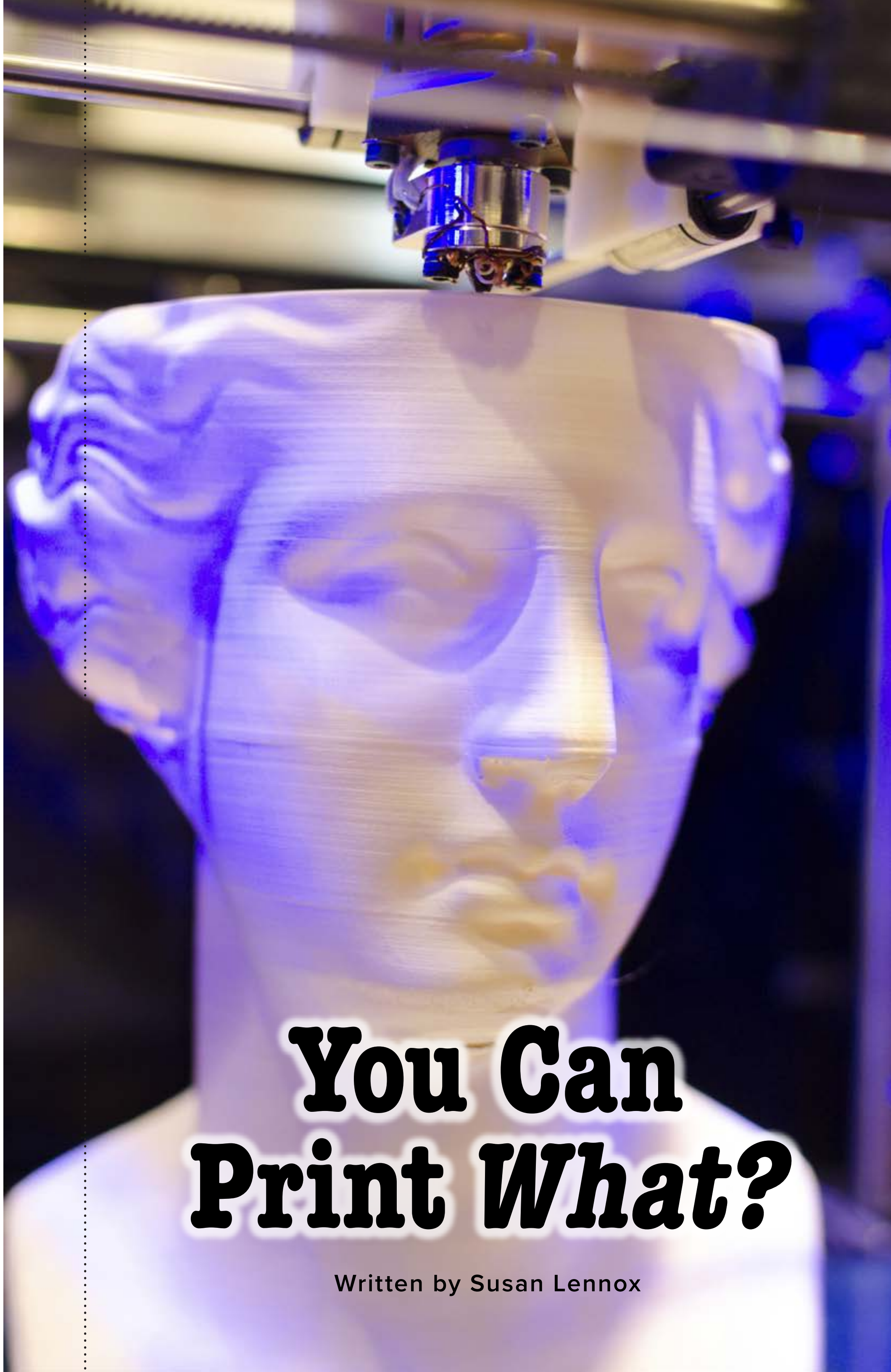


You Can Print What?

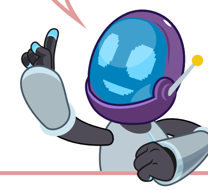
Written by Susan Lennox

You Can Print *What?*

Above: Children explore objects made by a 3D printer during an Earth Day event in New York.

Cover: A 3D printer replicates a sculpture head in plastic.

Written by Susan Lennox



Focus Question

How does new technology change our world?

Words to Know

customized	laser
data	particles
digital	prototypes
engineer	stereolithography
industrial	technology
innovative	three-dimensional

Joseph Gutenberg removes the first page proof from his printing press.

Table of Contents

These customized shoes were designed and created using a 3D printer.

Introduction

An **industrial** designer is hard at work creating a **digital** plan for a shoe you won't find in any store. She peers at the image on her monitor while using a special computer program to modify the shoe's shape and size. When she's satisfied with her work, she hits the "print" command. The printer at the other end of the room springs into action, whirring and humming. But it isn't printing just a picture of the shoe—it's creating an actual shoe!

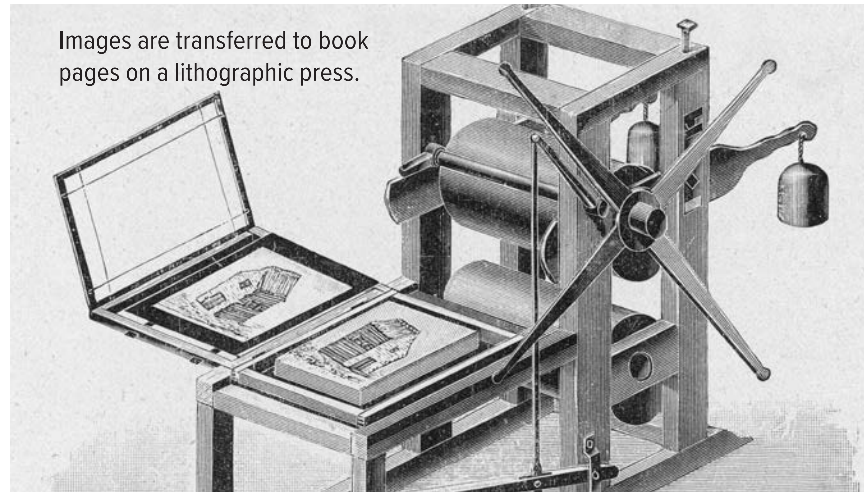
Welcome to the world of **three-dimensional** (3D) printing—the latest **technology** for making models, or **prototypes**, of almost anything imaginable! What comes out of a 3D printer is quite different from what comes out of a conventional computer printer. However, both types of printers use the same concept—layering—to make their final product.

From Stamps to Lasers

When most people think of printing, they imagine seeing text or images on smooth surfaces such as paper or cloth. The markings are made by applying a layer of ink onto the surface, either by hand or machine. Throughout history, a variety of printing techniques have been used to apply the ink.

About two thousand years ago, people in Eastern Asia used a process known as *xylography*, or woodblock printing. First, they drew an image on a block of wood. Next, they carved out the areas around the image. Then they coated the raised image that remained with ink and pressed it onto a flat surface. When they lifted the block, a thin layer of ink in the shape of the raised image appeared.

If you've ever used an ink stamp and stamp pad, you've used xylography. And you probably know that it would take a long time to fill just one page with multiple stamped images. This problem was solved with the invention of the printing press in 1450. Johannes Gutenberg, a German blacksmith, invented the printing press, a machine that allowed the first mass production of printed books.



Images are transferred to book pages on a lithographic press.

Instead of using one stamp at a time, many stamps, or pieces of type, were arranged in a tray. Then a piece of paper was pressed against the tray. In just one motion, a layer of inked type was pressed onto the entire page! This process made it much easier to produce multiple copies of the same page.

Over hundreds of years, printing processes evolved. One technique, called *lithography*, uses water and oil. Images are transferred to book pages on a lithographic press. The printed surface contains both the image and background areas on one level printing plate. The printing area is treated so that the image to be printed attracts oil-based inks. Since oil and water don't mix, the non-printed areas repel the inks. The lithographic process was devised in 1796 and is still used today to print many magazines and books.

In the 1950s, the first high-speed printer was invented for use with a computer called UNIVAC, which stored **data** onto spools of magnetic tape. A modified typewriter was connected to print out the information from the tape. This computerized typewriter was able to print words and numbers much faster than any person possibly could!

When desktop computers became popular in the 1980s, inkjet printers made it possible for people to print digital images right at their desks. Data sent from the computer tells the printer which shapes it needs to print. The printer reads the data and makes those shapes by first heating a cartridge filled with ink. As the ink warms, pressure inside the cartridge rises. Then the ink shoots out of the cartridge through a nozzle, or jet, and forms layers on the paper.

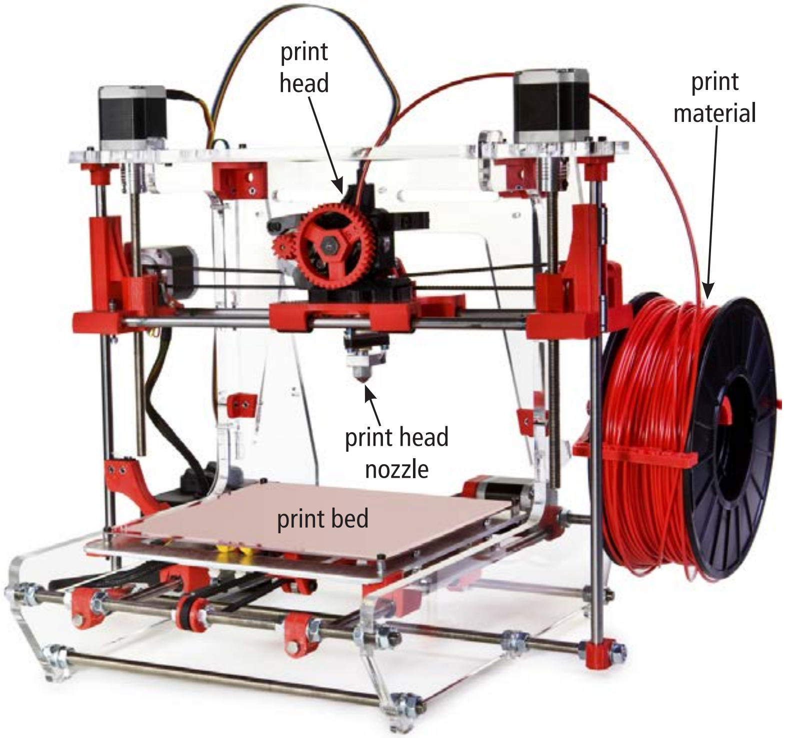
Laser printing technology was developed during the 1970s but did not become available for personal use until 1984. Laser printers use a process similar to lithography but with a twist. Instead of coating the printing surface with oil, this printing process uses lasers to zap an electrically charged image onto the paper. Dry ink **particles** pass over the paper and are attracted to the electrically charged image. A roller presses the particles to the paper, and a printed page appears.

2D to 3D

In 1984, Charles Hull invented a process called **stereolithography**, or what we now call 3D printing. Hull worked as a design **engineer**. He often grew frustrated with the weeks and months it took to develop, test, and redesign prototype plastic parts. He set out to solve this problem by finding a quicker way to make prototypes. Hull soon realized that he could use a layering process to create three-dimensional objects. 3D printing was born!


Charles Hull

Stereolithography uses inkjet and laser printer technology to create three-dimensional objects instead of flat, two-dimensional images. First, an image is created and stored as data using computer software. Then the data file is sent to a 3D printer. The printer uses the file as a kind of road map that tells the print head where to go. The print head is a tiny box with a nozzle, or jet, attached to it. It is suspended from a grid of metal bars that run along and across a print bed—the platform on which the object will be made.



This type of 3D printer uses plastic thread for printing material to create small objects.

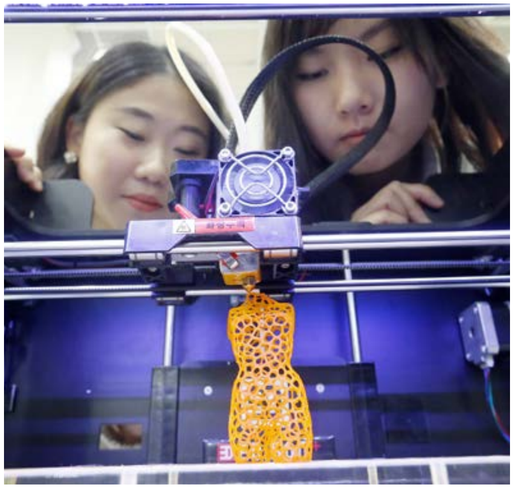
The print head moves back and forth and side to side above the print bed. As it moves, a thin stream of material, such as plastic, is propelled out of the print head nozzle and onto the print bed. According to the information sent from the computer image file, the material is stacked in microlayers as the print bed moves up and down. As each layer is deposited, a laser heats and bonds the new layer to the one beneath it. Bit by bit, layer by layer, a three-dimensional prototype of the image on the computer monitor rises from the print bed.

Who's Who in Printing Technology

- **1040 AD (approximate):** Bi Sheng, a Chinese printer, invents the world's first-known movable type technology using clay characters.
- **1450:** Johannes Gutenberg, a German blacksmith, invents the printing press, which allows the first mass production of printed books.
- **1796:** Alois Senefelder, a German author and actor, invents lithography as a cheap way to print his plays.
- **1800:** Lord Stanhope, a British scientist, builds the first cast-iron printing press.
- **1846:** Richard Hoe, an American inventor, invents the cylinder press. It can print eight thousand sheets an hour.
- **1886:** Ottmar Mergenthaler, a German-born American inventor, invents the Linotype machine. This is the first device that can make a printing press arrange complete lines of type.
- **1938:** Chester Carlson, an American physicist and attorney, invents electrophotography, also known as Xerox.
- **1953:** Remington-Rand, an American business machine manufacturer, creates the first high-speed printer for the UNIVAC computer.
- **1976:** Gary Starkweather, an American engineer, develops the first commercially used laser printer.
- **1984:** Charles Hull, an American design engineer, develops and patents stereolithography, the process known as 3D printing.

A New Technology Takes Off

By early in the twenty-first century, stereolithography became the preferred method for creating prototype parts used in industry and manufacturing. A prototype could be designed, produced, and tested in a matter of hours or days rather than weeks or months. Most early 3D prototypes were made of plastic. As the technology improved, other kinds of materials, such as ceramics and metals, were also used to make objects.



A 3D printer produces a sculpted form at a design show in Seoul, South Korea.

Being able to use a variety of materials expanded the possibilities for 3D printing. People from different fields saw this technology as a way to create **customized** items in a much shorter time. Designers could craft one-of-a-kind pieces of jewelry. Artists could create unique three-dimensional sculptures. And they could do it affordably, since 3D printing uses only as much material as is needed.

Beauty the bald eagle before and after her new beak was attached.

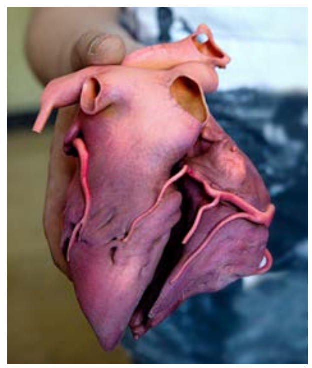
3D Printing Is for the Birds!

The ability to create customized 3D objects affordably has led to some amazing applications. When an engineer visited a wildlife rehabilitation center, he was struck by the plight of a bald eagle named Beauty. A hunter had shot off Beauty's top beak, making it impossible for her to hunt, eat, or preen herself. The engineer believed he had a 3D solution to Beauty's problem.

Working from an X-ray of Beauty's head, the engineer was able to design a plastic replica of Beauty's original beak on his computer. He then used a 3D printer to create the replica beak. Beauty had surgery to permanently attach the new beak, and she can now drink, eat, and clean herself like a normal eagle.

Have a Heart—or a Liver!

Engineers and scientists are developing a way to create real human organs using the layering technique to fuse living cells and form human tissue. A gel containing special cells taken from a patient's body is layered to form the correct shape, then incubated for a time to let the cells mature and bond to each other. Scientists have made ears, lungs, and livers using this technique. Researchers are now working on creating a human heart made of both natural tissue and artificial materials.



A 3D model of a human heart is used for medical education.

People who receive 3D organs may avoid the usual problem faced by transplant patients—rejection of the new organ. Whenever a foreign object is introduced into the body, the immune system treats it as a threat and attacks it. Transplant patients must take special medicine after surgery so their immune system doesn't destroy the transplanted organ. This medicine may also make patients more prone to infection. However, if the organ is made from the patient's own cells, rejection is less likely to occur. Patients may not have to take as much medicine, and they heal and recover more quickly with fewer complications.

A building block made by a 3D printer is used in the construction of the 3D Canal House in Amsterdam, Netherlands (left). An artist's sketch shows the completed house (right).

A Home Like No Other

Some 3D engineers have taken this technology to new heights—literally! A team of architects in Amsterdam is using a giant, portable version of a 3D printer to build a three-story house out of plastic. The machine creates interlocking bricks from layers of melted plastic that will be assembled into thirteen rooms. Construction will take three years—a long time by house-building standards. The team hopes this experiment will open the door to new ways of thinking about home construction using manufacturing processes such as 3D printing.

Clockwise, from left: A piece of art, a chocolate lollipop, a lamp, and a dinosaur head were all created with 3D printing.

The Future

The future of 3D printing holds endless possibilities. This amazing technology allows people to customize all sorts of products, from plastic dental braces to apartment-sized furniture to buildings. As the technology continues to evolve, 3D printers may be used in rather unusual situations, such as long-term space missions. With a 3D printer on board their spacecraft, astronauts would be able to manufacture replacement parts should old parts break down, or design and create new devices to help them live in space. This **innovative** technology could help humans survive as they explore strange, new worlds!

Glossary

customized *(adj.)* page 11
made personal; made special for one person

data *(n.)* page 7
facts and information, such as measurements or statistics, used to analyze or plan

digital *(adj.)* page 4
using information stored as a series of ones and zeros for computers or other machines to read

engineer *(n.)* page 8
a person who designs, builds, or repairs machines, buildings, bridges, or other structures

industrial *(adj.)* page 4
having to do with the creation of goods, especially using machines, automation, and technology

innovative *(adj.)* page 15
new and original

laser *(n.)* page 7
a device that projects intense, focused light of similar wavelengths

particles *(n.)* page 7
tiny pieces of matter

prototypes *(n.)* page 4
an original form used as the model for later production

stereolithography *(n.)* page 8
a printing process that creates a three-dimensional object from a digital design

technology *(n.)* page 4
the use of scientific knowledge or tools to make or do something

three-dimensional *(adj.)* page 4
having height, width, and depth; 3D

Learning A–Z	level **Y**	Multi-level	N/A
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Refer to the Focus Question on page 2 of this title to guide discussion and support additional learning connected to the text.

The invention of plastic revolutionized the world in so many positive ways, but at what cost? The negative effects of plastic on the natural world have become increasingly obvious as the oceans and its creatures struggle with plastic waste. **The Story of Plastic** introduces students to both the pros and the cons of this material and invites students to consider how they can help to reduce the impact of plastic on the environment. The book can also be used to teach students how to discern the author's point of view and to effectively summarize.

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Learning A–Z

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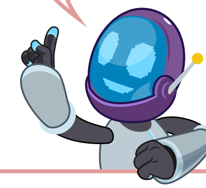
Written by Sean McCollum

The Story of Plastic

Written by Sean McCollum

Focus Question

What are the pros and cons of plastic?



Words to Know

atomic structure	molded
chemist	petrochemicals
consumers	synthetic
disposable	thermoplastics
durable	thermosets
manufactured	versatile

Connections

Writing

Write a haiku about plastic that follows the 5-7-5 syllable pattern. For example:

Plastic is so fun (5 syllables)

I use plastic all the time (7 syllables)

Need to recycle (5 syllables)

Social Studies

Write a persuasive essay for or against the use of plastic. Use information from the book and outside resources to support your position.

Table of Contents

Plastic bottles are light, strong, and cheap.

The Convenience of Plastic

In 2016, people around the world bought more than 480 billion plastic drinking bottles. That figure equals almost 70 bottles for each person on Earth. Every minute, more than a million plastic bottles are sold around the world.

Disposable bottles are just one example of how we use plastic. This amazing material is everywhere. It's lightweight and inexpensive, strong yet flexible, and can be **molded** into almost any shape for a million different purposes. Plastic products are all around us. Your computer keyboard? Your pen? Your candy bar wrapper? These and many other products are made of some type of plastic.

We live in an age of plastic. This material is a modern-day wonder. It is also cause for growing concern as we consider what to do with all our plastic trash.

A Short History of Plastic

Not that long ago, plastic didn't exist. In the 1850s, British inventor Alexander Parkes became the first maker of plastic. He called it Parkesine and saw it as a means for waterproofing cloth.

American John Wesley Hyatt bought the patent for Parkesine and conducted experiments to improve upon it. In 1869, he came up with a new kind of plastic and named it celluloid. It proved to be a good replacement for elephant ivory, animal horn, and tortoise shell. Combs, false teeth, piano keys, and billiard balls were all **manufactured** from this amazing new material. Celluloid was also used to make photographic and cinematic film.

Toy makers began using plastic almost as soon as it became available.

In 1907, Belgian American **chemist** Leo Baekeland accidentally invented the first completely **synthetic** plastic. Called Bakelite, the material could be formed into most any shape and then cooled into a hard, stiff form. It was the forerunner of such materials as plexiglass, polyester, nylon, and vinyl. Bakelite was used to make telephones, radios, kitchenware, car parts, and thousands of other products.

Bakelite popularized the use of plastic in household goods.

The word *plastic* itself, though, did not become popular until the 1930s. It comes from the Greek word *plassein*, which means "to mold or shape." Plastic can be molded and shaped into almost anything, and chemists and material engineers are still finding new forms and uses for it.

Do You Know?

Leo Baekeland was trying to create a new chemical for coating furniture when he accidentally created Bakelite. Like Baekeland, many scientists have created important substances by accident. Charles Goodyear reportedly created weatherproof rubber after accidentally leaving a chemical mixture on a hot stove. Chemist Stephanie Kwolek came up with Kevlar, used in bulletproof vests, while working to develop a strong, lightweight fiber for tires.

Cotton, wood, and latex from rubber trees are all natural polymers.

Miracle Material

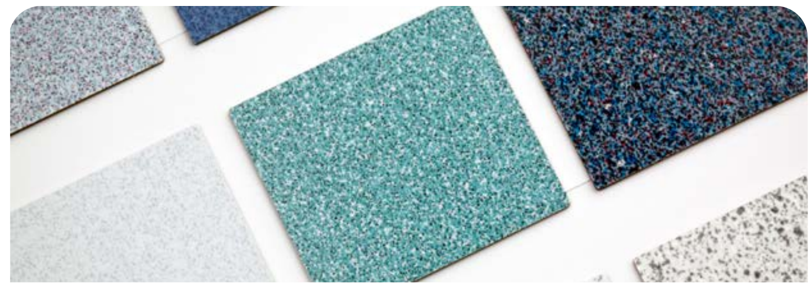
Plastic is special because of its **atomic structure**. Atoms link together to form molecules—the tiny building blocks of all matter.

Plastic is a polymer—a substance made of large molecules that are linked in repeating units. These molecules bond very strongly in long chains, making them difficult to break and therefore very **durable**. Cellulose, a material that forms the cell walls of plants, is a type of natural polymer.

Most plastics today, though, are made from synthetic polymers that don't occur in nature. Scientists are able to create these polymers using oil, natural gas, or chemicals that can be made from them. The chemicals are loaded with carbon atoms that form strong bonds with other atoms.

There are two types of plastics—**thermosets** and **thermoplastics**.

Thermosets are hard and brittle, and can withstand heat. Once they are shaped and cooled, they cannot be remelted. Examples of thermoset plastic include bathroom tiles, countertops, and baking dishes.



Thermoset countertop tiles are strong and heat resistant.

Thermoplastics can stretch and can also be melted, reformed, and recycled fairly easily. Milk jugs, plastic storage containers, and most toys are examples of this kind of plastic. Thermoplastics make up more than 90 percent of plastic products we know and use.

Plastic storage containers are light and strong.

Plastic has largely replaced leather and cloth as the main material used in athletic shoes.

The Case for Plastic

In the past century, plastic became the shape-shifting wonder of manufacturers' dreams. Wood, metal, stone, glass, and ceramics can be fragile and difficult to work with. Plastic, on the other hand, can be molded with great precision to meet the needs and wishes of businesses and **consumers**.

Plastic is easy to make and transform, and has come to represent convenience. It is the plastic bottle we drink from, the toothbrush we use to clean our teeth, and the disposable plates we picnic on and toss away. Plastic has also proven its value in other ways we may not notice.

Plastic helps make cars more lightweight and saves fuel.

One example of plastic's benefits is energy savings. Builders use plastics to insulate homes, schools, and office buildings. Insulation saves energy by keeping heat in on cold days and keeping heat out when the thermometer climbs. Plastic is also lighter than glass or any other material that might be used for packaging. The lighter weight saves fuel when shipping goods. In a similar way, plastic parts have helped reduce the weight of cars, trucks, aircraft, and other forms of transport. The less a vehicle weighs, the less fuel it needs to move.

In turn, lower manufacturing and shipping costs save money for shoppers. Most plastic products can also be mass-produced more efficiently and cheaply than products made from other materials, again reducing costs for consumers. Plastic packaging also reduces food waste by keeping meat, bread, and vegetables fresh for longer periods. Plastic has proven to be good business for manufacturers, retailers, and customers.

Any visit to a hospital or doctor's office demonstrates plastic's value to health care. Operating rooms are packed with plastic equipment, from monitors to tubes to surgical instruments. Plastic is easy to clean and resists contamination. Cheap, disposable supplies like syringes, examination gloves, and patient gowns reduce costs as well as the chances of infection.

Cheap to make, lightweight, durable, **versatile**—these are the big reasons we have found so many uses for plastic in our lives.

Disposable plastic medical supplies help keep doctors and patients safe in hospitals but create a large amount of plastic trash.

The Problem with Plastic

Plastic has proven to be a miracle material, but more and more its drawbacks are there for all of us to see. A glance into a full dumpster reveals the problem—plastic trash. Plastic is turning into an environmental disaster.

A plastic bottle of water can be a cool, refreshing drink, but it comes at a price. More than four hundred years from now, that plastic bottle will likely still be on Earth, perhaps buried in a landfill or lying on the seafloor.

Plastic's durability presents huge environmental challenges. Most food, wood, paper, and other plant materials break down over time and can be reused by nature. Plastic is different, though. Because most plastic is made from **petrochemicals**, natural forces cannot break it down easily, if at all. Over time, a plastic object may break into smaller and smaller pieces called *microplastics*, but it never completely disappears.

The low cost of making plastic also adds to the problem. It is cheaper to make new plastic bottles and other products than to reuse or recycle them. Many communities in the United States have recycling programs, but less than 10 percent of plastic is recycled, while another 15 percent is burned for energy. More than 75 percent of plastic is trucked to landfills or ends up dumped in the ocean.

Plastic trash is not just ugly; biologists have proven that plastic is harming and killing wildlife. Dead whales have washed ashore with their guts stuffed with plastic bags they have mistakenly swallowed, thinking they were jellyfish or other food. Many seabirds are dying after swallowing plastic bits, and researchers are finding microplastics in fish, oysters, and other seafood we eat.

As the plastic piles up, more people are taking action to help solve these problems. Communities are banning disposable plastic bags in their stores. Some countries are experimenting with charging customers a small deposit on each plastic drink bottle; they then get that money back when the container is returned. Norway's "Deposit Return Scheme" has resulted in 96 percent of that country's plastic bottles being recycled instead of becoming garbage.

Plastic drinking straws can often be replaced with paper or metal straws, which are less harmful to the environment.

In some cases, kids are leading the way in tackling plastic pollution. Milo Cress was nine years old when he started the Be Straw Free campaign in 2011. He urged restaurants and their customers to stop using plastic straws. The organization estimates that Americans use half a billion straws every day, and straws are among the most common forms of plastic trash.

Still, plastic pollution remains a big problem in search of an answer.

Inventing a New Future for Plastic

Plastic is here to stay for many, many reasons. Plastic products make our daily lives easier, more affordable, and more convenient.

Chemical engineers and inventors used their creative genius and worked hard to create a material that has so many good uses. Now, similar minds need to embrace the challenge of creating new forms of plastic that do less harm to the environment. In the meantime, we all can take action to be more mindful of our plastic habits. We need no special talents or knowledge to reduce our use of plastic, reuse it when possible, and recycle it at every opportunity—while still enjoying its benefits.

Biodegradable Plastic?

Plastic makers are working to create biodegradable plastics. These plastics are designed to break down naturally from exposure to weather or by means of chemicals released by microorganisms. However, materials engineers and chemists have yet to produce plastics that break down under normal environmental conditions.

A fork made from a special corn-based plastic breaks down in as little as forty-five days.

Glossary

atomic structure *(n.)* page 7
the arrangement of the most basic parts, including the protons, neutrons, and electrons, of an element or substance

chemist *(n.)* page 6
a scientist who studies chemical elements and how chemicals interact

consumers *(n.)* page 9
people who buy or rent goods or services and use them

disposable *(adj.)* page 4
meant to be thrown away after being used

durable *(adj.)* page 7
sturdy and able to last for a long time

manufactured *(v.)* page 5
made into finished products from raw materials

molded *(v.)* page 4
formed or made into a shape

petrochemicals *(n.)* page 13
chemicals that are made by processing natural gas or petroleum

synthetic *(adj.)* page 6
human-made by combining two or more substances; not occurring in nature

thermoplastics *(n.)* page 8
materials that become rigid when cooled and become soft and flexible again when heated

thermosets *(n.)* page 8
materials that become permanently rigid when heated

versatile *(adj.)* page 11
usable in many different ways

Key Vocabulary Context Cards

Text Set
Scientific Innovations

adapt
(verb)

Key Vocabulary Context Card
Reading A–Z

fold

Text Set
Scientific Innovations

1. To **adapt** means to adjust to a certain situation.
2. The author will **adapt** the novel into a movie.
3. A species that cannot **adapt** to environmental changes will need to migrate in order to survive.

Text Set
Scientific Innovations

artificial
(adjective)

Key Vocabulary Context Card
Reading A–Z

fold

Text Set
Scientific Innovations

1. An **artificial** satellite or limb is one that does not occur naturally but instead is made by humans.
2. AstroTurf is the brand name of a type of **artificial** grass used in some sports stadiums.
3. Synonyms for ***artificial*** include *fake*, *synthetic*, *imitation*, and *mock*.

Text Set
Scientific Innovations

biomimicry
(noun)

Key Vocabulary Context Card
Reading A–Z

fold

Text Set
Scientific Innovations

1. In **biomimicry**, people design new materials that are inspired by the way biological structures or systems work.
2. One example of **biomimicry** is the invention of Velcro, which was modeled on the way burrs hook onto things.
3. Thanks to **biomimicry**, we now have such innovations as antifreeze and antireflective lenses.

Key Vocabulary Context Cards

Text Set
Scientific Innovations

design
(verb)

Key Vocabulary Context Card
Reading A–Z

fold

Text Set
Scientific Innovations

1. Before you start shooting a movie, it's important to **design** all the scenes.
2. To **design** is to draw or plan.
3. She wants to **design** the costumes for the student play.

Text Set
Scientific Innovations

durable
(adjective)

Key Vocabulary Context Card
Reading A–Z

fold

Text Set
Scientific Innovations

1. If an object is **durable**, it can last a long time because it is sturdy.
2. Denim is a more **durable**, or long-lasting, material for pants than silk.
3. Cardboard is more **durable** than copy paper for a poster or report cover.

Text Set
Scientific Innovations

engineer
(noun)

Key Vocabulary Context Card
Reading A–Z

fold

Text Set
Scientific Innovations

1. A mechanical **engineer** designs, constructs, or maintains machines and mechanical systems.
2. An **engineer** uses scientific and mathematical knowledge to create or repair things.
3. An architectural **engineer** is someone who designs and builds structures, such as homes or office buildings.

Key Vocabulary Context Cards

Text Set

Scientific Innovations

imitate

(verb)

Key Vocabulary Context Card

Reading A–Z

fold

Text Set

Scientific Innovations

1. To learn to talk, babies **imitate** others.
2. The boy would laugh every time his little sister would **imitate**, or mimic, the way he walked.
3. To **imitate** someone is to copy his or her behavior or manners.

Text Set

Scientific Innovations

innovative

(adjective)

Key Vocabulary Context Card

Reading A–Z

fold

Text Set

Scientific Innovations

1. An **innovative** idea is new and usually an advancement over what came before.
2. Leonardo da Vinci's **innovative** ideas were very original for the time in which he lived.
3. Cell phones were **innovative** when they first came out, but now they're commonplace.

Text Set

Scientific Innovations

manufacture

(verb)

Key Vocabulary Context Card

Reading A–Z

fold

Text Set

Scientific Innovations

1. To **manufacture** is to create finished goods, especially using industry.
2. A toy factory might **manufacture** dolls and action figures.
3. Using robots, the company is able to **manufacture** cars by the thousands.

Key Vocabulary Context Cards

Text Set
Scientific Innovations

prosthetic
(adjective)

Key Vocabulary Context Card
Reading A–Z

fold

Text Set
Scientific Innovations

1. A person might wear a **prosthetic** limb due to a birth defect or an injury that required amputation.
2. He wears a **prosthetic**, or artificial, leg because of an accident three years ago.
3. You would hardly guess that she has a **prosthetic** arm because she moves it in such a natural manner.

Text Set
Scientific Innovations

technology
(noun)

Key Vocabulary Context Card
Reading A–Z

fold

Text Set
Scientific Innovations

1. **Technology** puts science to work in everyday life.
2. Engineers use and develop **technology** in their work.
3. Cell phones and computers are examples of modern **technology**.

Text Set
Scientific Innovations

three-dimensional
(adjective)

Key Vocabulary Context Card
Reading A–Z

fold

Text Set
Scientific Innovations

1. A **three-dimensional** object has height, width, and depth, unlike a two-dimensional object, which lacks depth.
2. A solid is a **three-dimensional**, or 3D, object.
3. A **three-dimensional** diagram of a cube looks realistic, not flat.