

## WORDMARK

### compete

to try hard to outdo others at a task or in a contest

### demand

the amount of goods or services that buyers will purchase at a particular price

### economics

(*ek uh NOM iks*)  
the study of the way money, goods, and services are made and used

### industry

the activity of producing goods and services

### mass production

the process of producing large quantities of goods, by hand or by machine

### profit

(*PROF it*) the amount of money left over after all the costs have been subtracted from the money earned

### supply

the amount of goods and services producers will make available at a particular price

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What are the economic costs of Hurricane Katrina?

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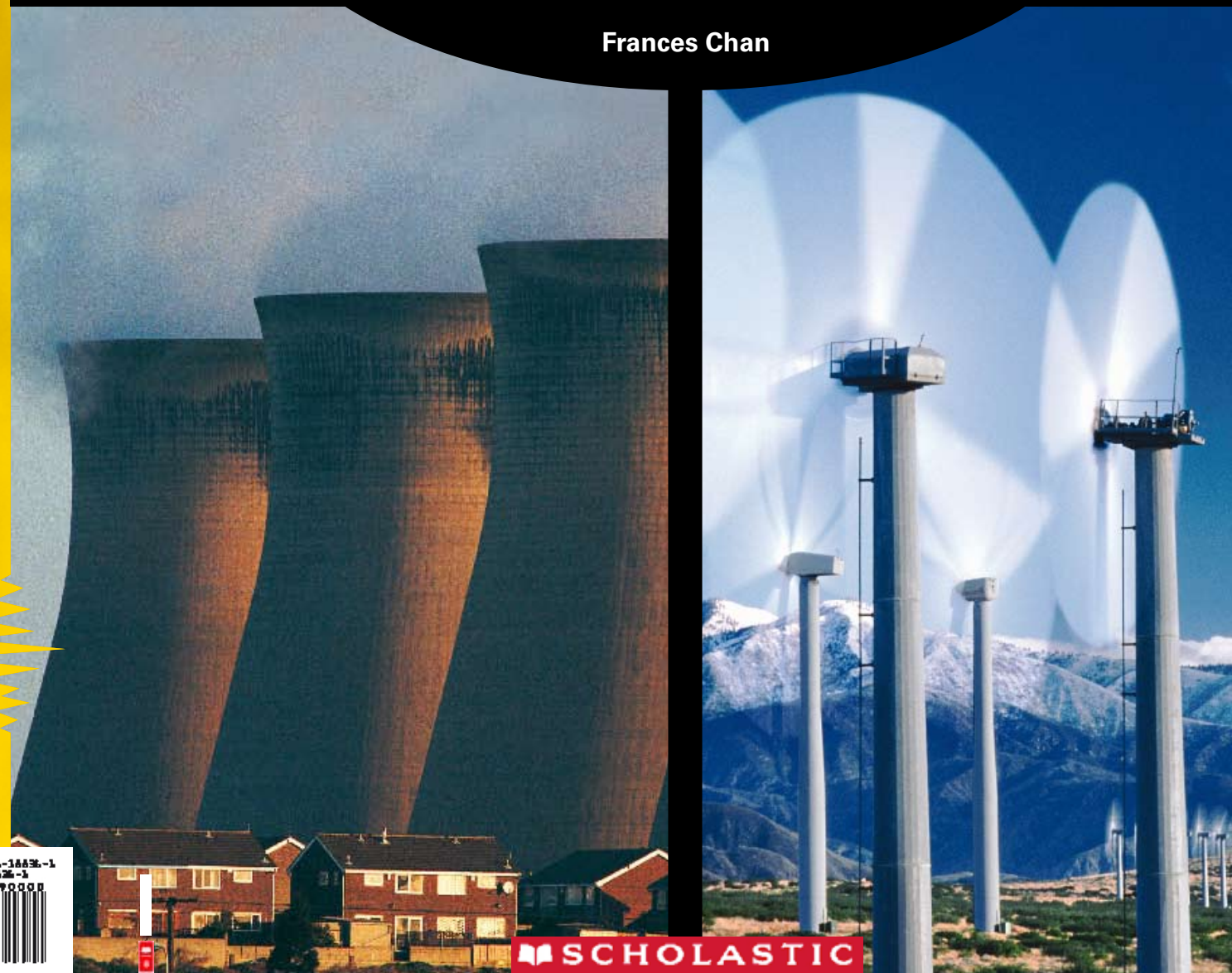
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DOLLARS AND SENSE

# Dollar\$ and Sense

ECONOMICS AND SCIENCE

Frances Chan



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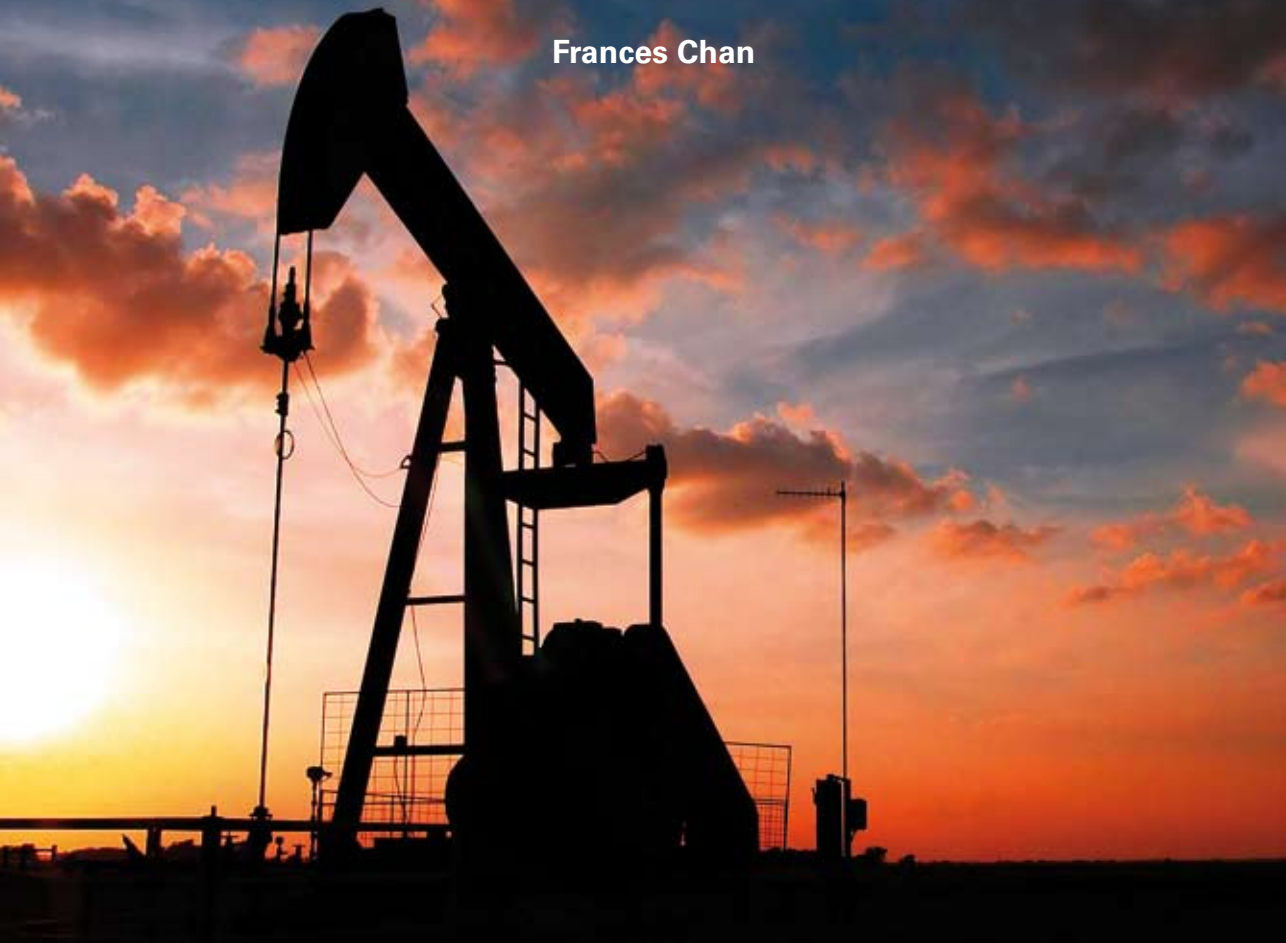
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**SHOCKWAVE**  
SCIENCE

# Dollar\$ and Sense

**ECONOMICS AND SCIENCE**

Frances Chan



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**demand** the amount of goods or services that buyers will purchase at a particular price

**economics** (*ek uh NOM iks*) the study of the way money, goods, and services are made and used

**industry** the activity of producing goods and services

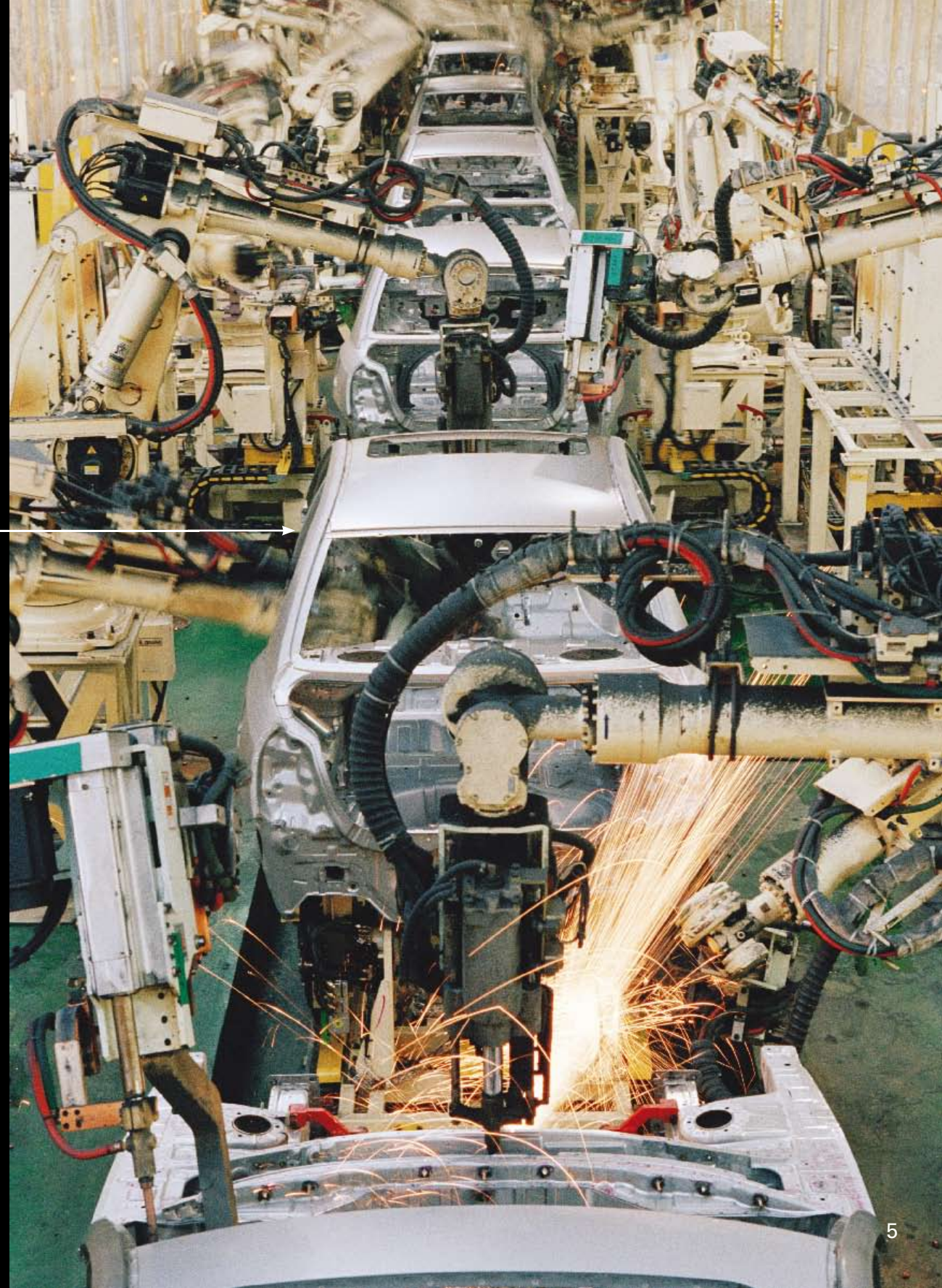
**mass production** the process of producing large quantities of goods, by hand or by machine

**profit** (*PROF it*) the amount of money left over after all the costs have been subtracted from the money earned

**supply** the amount of goods and services producers will make available at a particular price

.....  
For easy reference, see Wordmark on back flap.  
For additional vocabulary, see Glossary on page 32.

Many words can be used as both nouns and verbs. Three of the words featured on this page are defined as nouns, but are also used as verbs. They are *demand*, *profit*, and *supply*.



**Economics** is the study of how goods and services are bought, sold, and distributed. Economics and science are closely linked. When scientists invent something, an **industry** may use that invention to create a new product. As products are manufactured, sold, and distributed, the interplay of economics and science is set in motion.

When a product is offered for sale, it is subject to the principles of **supply** and **demand**. Supply is the amount of goods or services produced. Demand is the need or desire for those goods or services. If only one producer is making a product, that producer can set the price. It can also control the supply. But if several producers **compete** to make a product, the consumer has more choices.

Demand plays an important role in what is produced. **Innovation** is often in the form of scientific advances or inventions. It responds to demand. In some way, every citizen contributes to a country's economy.

The health of a country's economy is measured by its Gross Domestic Product (GDP). The GDP is everything that is produced by all the people and businesses in a country. Governments rely on scientists and researchers in many fields to come up with new ideas. These new ideas spur economic activity. In this book, you will read examples of how science and the economy are connected.

2006 Top Ranked Countries by GDP

U.S.A.	12.9
China	10.0
Japan	4.2
India	4.0
Germany	2.6
United Kingdom	1.9
France	1.8
Italy	1.7
Russia	1.7
Brazil	1.6

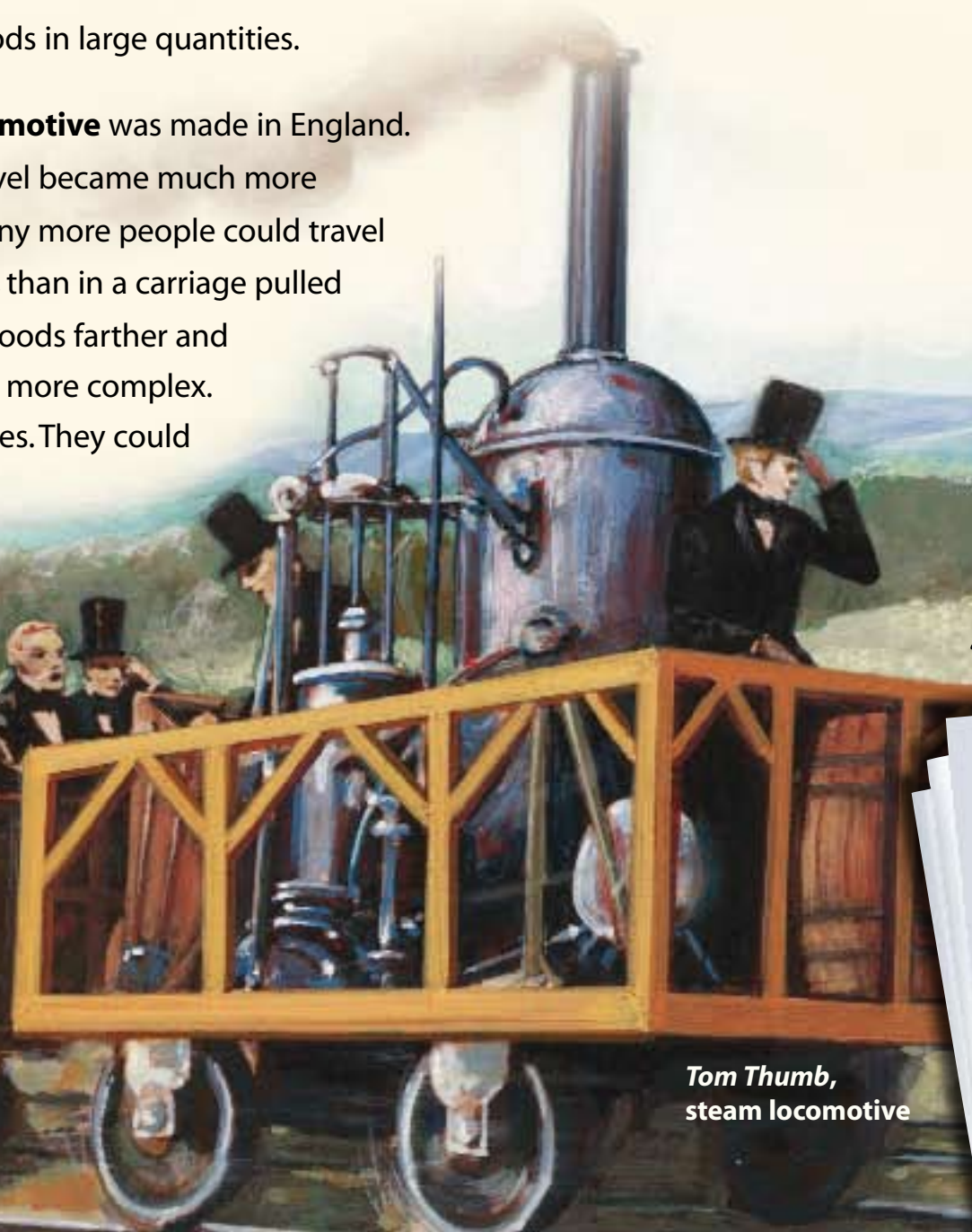
GDP in Trillions of Dollars

# STEAMING AHEAD

During the 1700s, the invention of the steam engine brought about an economic **boom** in England. Many goods were no longer produced by hand. Instead, they were made in factories. The factories had steam-powered machines. The machines could manufacture goods in large quantities.

In 1804, the first workable steam **locomotive** was made in England. It changed transportation forever. Travel became much more affordable for the average person. Many more people could travel in carriages pulled by a steam engine, than in a carriage pulled by a horse. Steam trains also carried goods farther and faster than ever before. Trade became more complex. More goods could travel to more places. They could travel quickly and directly.

The heading indicates that this page will be about both the use of steam, and how steam has contributed to progress. It helps to be able to predict what the page will be about.

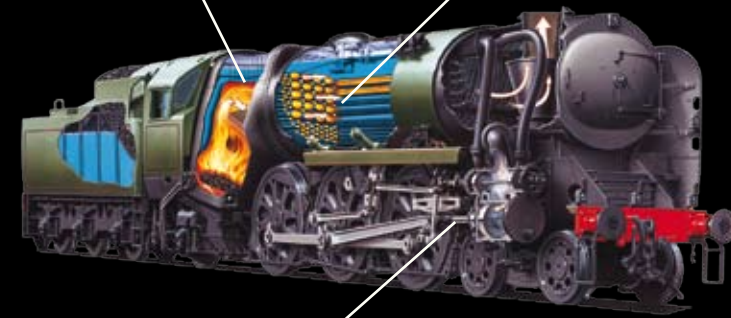


*Tom Thumb,*  
steam locomotive

## KNOW THE SCIENCE

### How a Steam Locomotive Works

- 1 A fire is started in the firebox using wood or coal.
- 2 The fire heats up water in the boiler. The water turns into steam.



- 3 High-pressure steam expands. This forces the pistons to move. Each piston moves a large, iron arm. The arm rotates the wheels. The train moves forward.

August 25, 1830

THE DAILY TIMES

### Hail the Rail

*Tom Thumb* is the first steam locomotive made in America. The open railcar traveled from Baltimore to Ellicott's Mills today. The journey was 13 miles. It took less than an hour. It was a thrilling ride for the 18 passengers. The locomotive reached speeds of nearly 20 miles per hour! It has been nicknamed the "iron horse."

# BUSINESS BOOMS

Railroad building was big business in the 1850s. Many people were eager to buy **shares** in the railroad companies. This gave the railroads more money to expand. They laid new tracks. They built more engines and train cars. The United States government also granted land to the railroad companies. It lent them money too. It wanted to attract settlers to undeveloped parts of the American West. Soon cities and businesses sprang up along the new routes.

In the early 1860s, two United States railroad companies were given the task of building the world's first **transcontinental** railroad.

One company started from the east coast. The other started from the west coast. The two rail lines finally met in Utah in 1869. The two railroad companies controlled the transcontinental route. They could set prices for using the rails. They maintained a **monopoly** until the early twentieth century.

In 1869, workers celebrated the joining of the two rail lines at Promontory, Utah.

## Railroads – Economic Effects

- new tracks laid
- more engines and train cars
- new towns and cities
- new businesses
- settlers brought skills to new places

## SHOCKER

Hundreds of workers died while building the transcontinental railroad. Some were killed while blasting tunnels with dynamite. Some got sick working in the cold. Others were killed by avalanches.

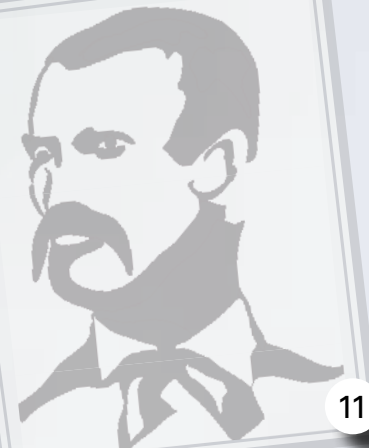
## The Good and the Bad

Railroad expansion provided jobs for many people. Unfortunately, it also provided opportunities for train robbers! Robbers would jump onto trains from horseback. They held up passengers at gunpoint. One of the most famous train robbers in the late 1800s was Jesse James.

January 31, 1874 THE DAILY TIMES

## James Strikes Again

Jesse James robbed a train at gunpoint today at Gads Hill, Missouri. The James Gang took \$10,000 worth of money. It also took a great deal of jewelry from the passengers. A \$5,000 reward has been offered for the capture of Jesse James – dead or alive.



# SLICK AND THICK

In 1885, another important invention came along. It was the gasoline-powered automobile. It brought about a worldwide demand for oil. Fuels, such as gasoline and **diesel**, are made from oil. Most cars, trains, planes, and ships are fueled by oil in some form.

The first cars were expensive to buy. They were slow to manufacture. They also failed to turn a **profit**.

Then, in 1914, the **mass production** of cars began in the United States. That innovation changed everything! Cars could be made and sold more cheaply. With more cars on the road came the demand for gasoline and gas stations. By the 1950s, many countries, including the United States, had switched from steam- to diesel-powered trains. Airplanes created another transportation boom. They further increased the demand for oil.

In the 1800s, some oil wells burst. They sprayed oil sky-high. They were known as gushers.

August 28, 1859 THE DAILY TIMES

## Oil at Last!

The first oil well in the United States was discovered today by Colonel Edwin Drake. Drake and his men finally struck black gold after they drilled a hole 69 feet deep near Titusville, Pennsylvania. The oil was brought to the surface using a hand-operated pitcher pump. It was then collected in a bathtub.



Edwin Drake (right) in front of his oil well

KNOW THE SCIENCE

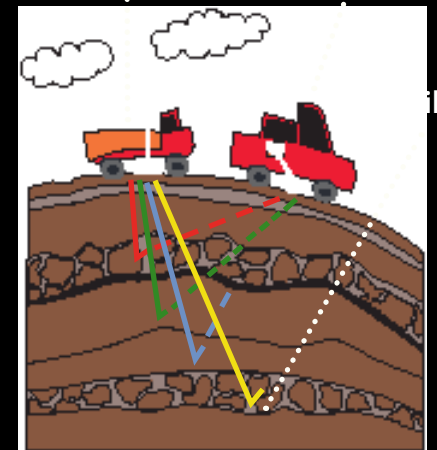
## Finding Oil

In the past, drilling for oil was a risky business. For every ten wells drilled, usually only two produced oil. Now **geologists** use modern equipment to locate oil. They take magnetic and **gravity** measurements of underground rock.

Thumper trucks help find oil. A truck sends waves of **vibrations** into the ground. The waves bounce off layers of rock. Another truck records the pattern of the rebounding vibrations. From this, scientists can make a map of the underground rock formations.

Thumper truck

Recording truck





# BIG BUSINESS

Oil wells cost between \$50 million and \$200 million to set up. Despite these initial costs, oil companies make huge profits. More than 80 million barrels of oil are used worldwide every day. Some countries need more oil than they produce. So they must **import** it. Others produce more oil than they need. So they **export** it. Most oil-producing countries depend on oil profits for a huge portion of their GDP.

Supply and demand affect the price of oil. When there is industrial growth, the demand for oil increases. It also increases in times of war or natural disaster. Increased demand drives prices higher. This situation favors oil exporters. In contrast, during more peaceful times, there may be less demand for oil. Prices tend to fall.

## Oil Prices Go Up

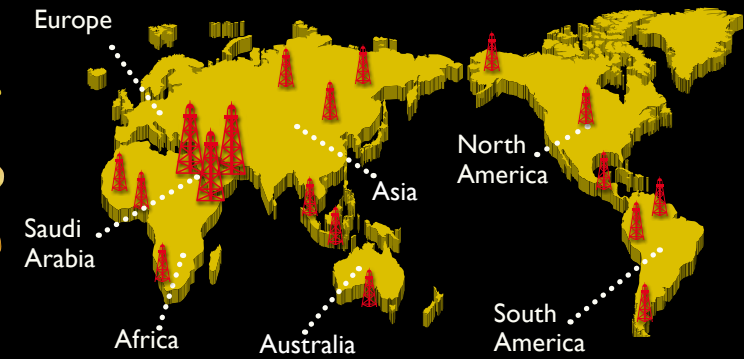
- when demand increases
- with wars and natural disasters
- as industry grows

## Oil Prices Go Down

- when demand decreases
- during times of peace

Oil is highly **flammable**. Oil-well fires can result in the loss of millions of barrels of oil.

## Major Oil Fields of the World



## Oil Equals Power

The Middle East has the world's largest oil reserves. In the 1970s, oil-producing countries in the Middle East limited their oil supply to the rest of the world. This caused a major **energy crisis**. Oil prices were \$2.75 per barrel in 1973. They went up to \$34 in 1981. During this time, many countries started to explore ways to conserve energy. Some countries also started searching for their own oil reserves.

May 23, 2007

THE DAILY TIMES

## Gas Prices Soar

People in Chicago are now paying the highest gas prices in the United States. They are paying about \$3.59 per gallon. Last year, gas was \$2.98 a gallon in Chicago. Some experts say we could be paying an average of \$4 dollars a gallon before long.



# OIL PROBLEMS

Oil can bring great wealth to an economy. It also brings problems that are costly to the environment. Most of the oil that we use is burned as fuel for transportation and factories. This produces harmful gases, such as sulfur dioxide. Pollution from these gases damages people's health. It harms the environment too. Another gas, carbon dioxide, is also produced. Increased carbon dioxide levels are thought to cause **global warming**.

Oil spills are another problem. More than 600 million gallons of oil are spilled each year. Tankers often have accidents. Natural disasters can also cause spills. Oil spills are costly to clean up. They can kill thousands of animals. Water supplies become **contaminated**.

Oil tanker on fire, causing an oil spill



The author has used two paragraphs on the opposite page. That means there should be two main points (air pollution and oil spills). Understanding how paragraphs are used makes reading easier.

EFFECT ON ECONOMY

Slick and Thick continued

## Expensive Spills

**1978:** The American oil tanker *Amoco Cadiz* ran aground near France. It spilled 68 million gallons. The slick covered 125 miles of coast. In 1990, the French government was finally awarded \$256 million from Amoco for damages.

**1989:** *Exxon Valdez* hit a reef near Alaska. It spilled 10 million gallons. More than 10,000 workers took three years to clean up the spill. Cleanup costs were more than \$3 billion.

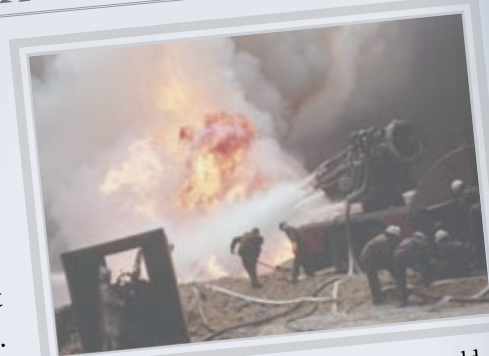
**2002:** The oil tanker *Prestige* sank near Spain. It spilled 20 million gallons. Cleanup costs exceeded \$2 billion. It also cost about \$134 million and took two years to remove the oil remaining in the wreck.

November 6, 1991

THE DAILY TIMES

## End of Oil Fires

The oil-well fires in Kuwait are finally out. About five million barrels of oil have been burned every day since February. Iraqi forces deliberately set fire to about 600 Kuwaiti oil wells. They also released about eight million barrels of oil from offshore oil wells. The cost of the cleanup has been estimated at more than \$700 million.



Oil-well firefighters from around the world help put out the Kuwait fires.

# BIRD FLU IS BAD FLU

Natural disasters and outbreaks of diseases are often devastating to the economy. People may lose their jobs and homes. They may even lose their lives. Sometimes science helps remedy an economic emergency.

Recently, a terrible kind of flu began to spread from birds to humans. It is called bird flu, or avian influenza. Until 1997, bird flu had **infected** only birds and pigs. Then 18 people in Hong Kong caught the **virus**. Six of the people died. More than a million birds were destroyed in an effort to contain the virus.

Since 2003, other Asian countries have had bird-flu outbreaks. Parts of Europe have had outbreaks too. In 2007, there was an outbreak in England. Nearly 160,000 turkeys were destroyed. This was to prevent the flu from spreading. As a result, the English turkey industry lost \$18 million in sales.

*Flu* is the short form of *influenza*. The short form is used for many medical conditions, for example: *Hep A* (hepatitis), *AIDS* (acquired immunodeficiency syndrome), and *TB* (tuberculosis).

This area has had bird-flu outbreaks. Workers wear protective clothing and masks to collect dead birds.

## SHOCKER

Since 2003, about 15 million birds have died or been destroyed because of bird flu. So far, there have been 157 human deaths from the disease.

KNOW THE SCIENCE

## Spreading Bird Flu

Ducks, geese, and swans can spread the bird-flu virus as they migrate. People and other birds can catch the virus if they have contact with infected droppings or saliva. The disease can also spread through contaminated cages, shoes, or machinery. Bird-flu **symptoms** in humans are much like the common flu. They include fever, coughing, and a sore throat. They also include aching muscles, and eye or lung infections.



Birds must be given two doses of **vaccine** to protect against bird flu. Each dose costs about six cents.

# FINDING A CURE

There are hundreds of kinds of bird-flu viruses. Only four have spread from birds to humans. As yet, bird flu has not spread from person to person. But viruses often change. Some day, a bad bird-flu virus could change into a form that can spread from person to person. If this happens, it could cause a **pandemic**.

Vaccines against other flu viruses are already available. One company is also producing a vaccine against one kind of bird-flu virus. However, this vaccine may not be effective against a pandemic. In order to create a vaccine, scientists need the actual virus that causes the pandemic. If such a virus does emerge, it could take months for a new vaccine to be produced.

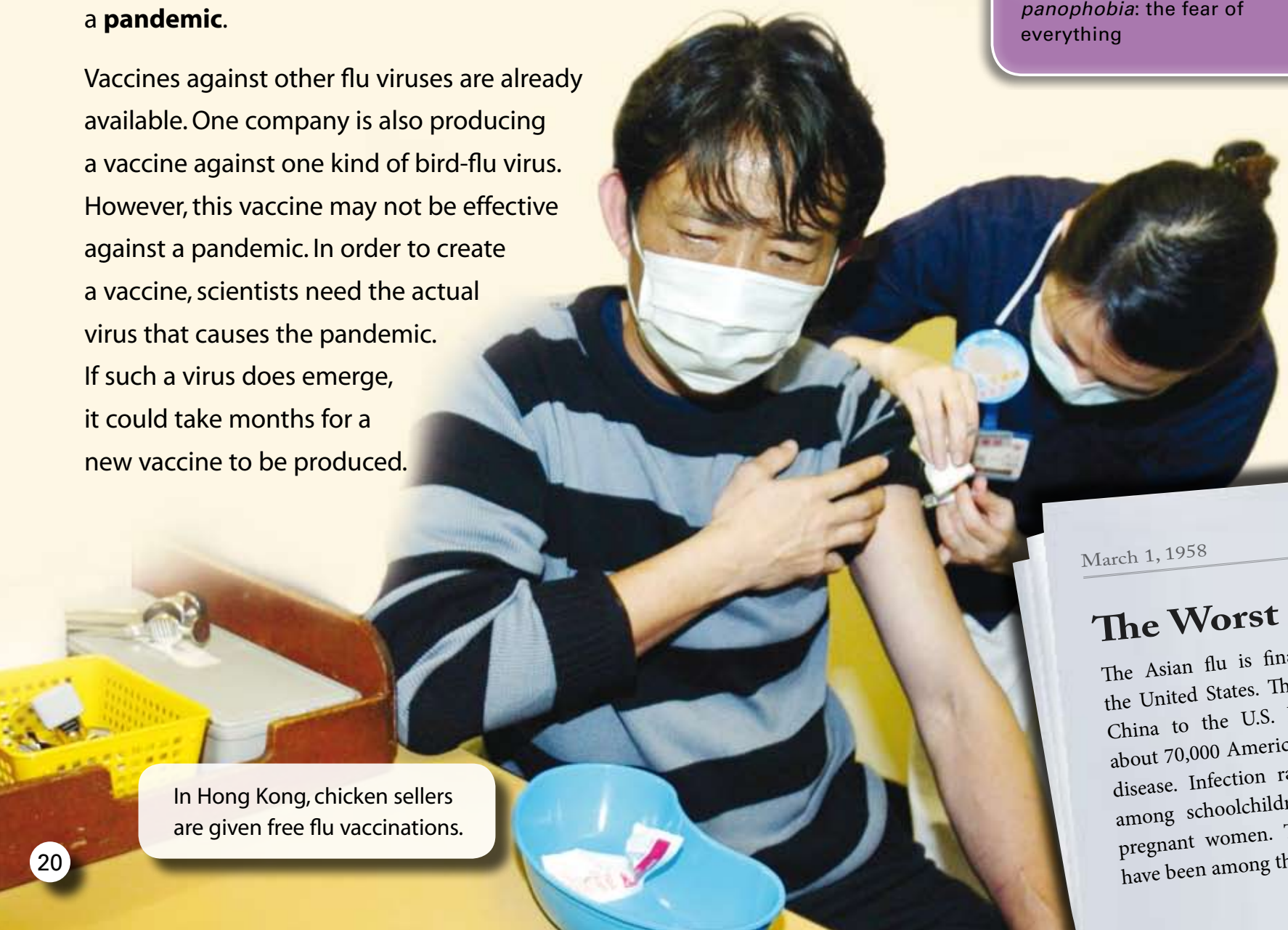
The prefix *pan-* in *pandemic* means "whole" or "all." Similar words include:  
*panorama*: a complete view of everything  
*pantheism*: a worship of all gods  
*panophobia*: the fear of everything

## Big Spenders

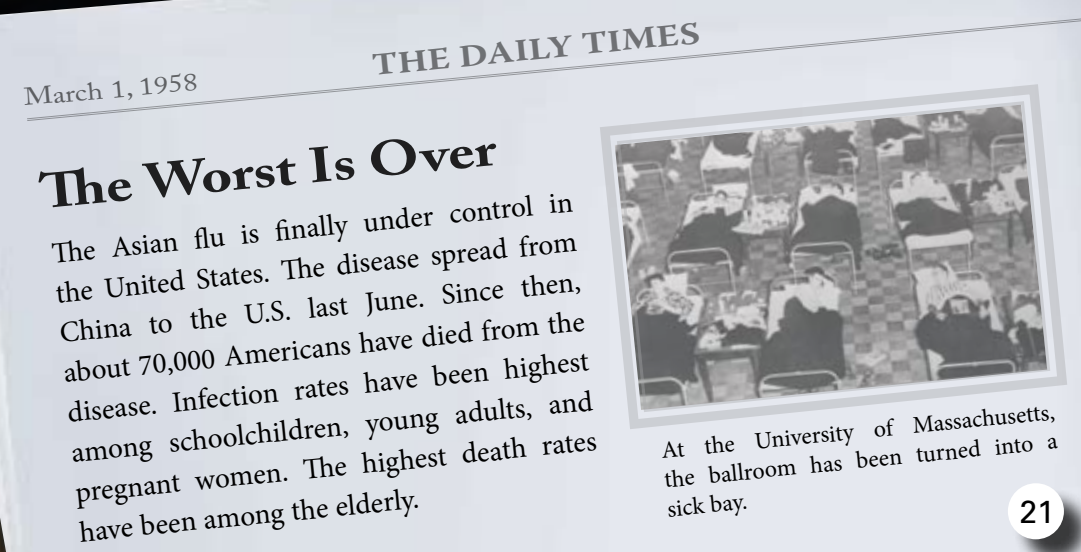
In 2006, the U.S. government gave \$1.2 billion to various drug companies to develop a vaccine for bird flu. Other governments are spending millions of dollars on vaccines for seasonal flu. The World Bank believes that a bird-flu pandemic could cost the global economy as much as \$2 trillion. As many as 70 million lives could be lost worldwide.

## Past Pandemics

- 1918–19: Spanish flu – about 20 million deaths
- 1957–58: Asian flu – about 2 million deaths
- 1968–69: Hong Kong flu – about 750,000 deaths
- 2003: SARS (Severe Acute Respiratory Syndrome) – 774 deaths



In Hong Kong, chicken sellers are given free flu vaccinations.



At the University of Massachusetts, the ballroom has been turned into a sick bay.

# HURRICANE HORROR

Sometimes events that are out of people's control can affect an economy. On August 29, 2005, Hurricane Katrina swept through the Gulf of Mexico. Many parts of Alabama, Mississippi, and Louisiana were destroyed. Katrina was the most damaging natural disaster in United States history.

The hurricane caused sea levels to rise as much as 28 feet. The flooding broke many **levees** protecting New Orleans. Nothing could stop the water that gushed in from surrounding rivers and lakes. About 80 percent of the city was flooded. The water was as deep as 20 feet.

## SHOCKER

Some people in New Orleans were trapped in their attics for days before they were rescued. Some died while waiting.

As soon as the hurricane hit, there was a power outage. Airports and highways in New Orleans were flooded and closed. Most of the city pumps failed to work. Portable pumps had to be used. It took several months to drain the floodwater from the city.

I remember seeing lots of items about Hurricane Katrina on TV. So I kind of knew what to expect. Reading is so much easier when you already know something about the topic.

## Levee Losses

The hurricane broke about 28 levees in New Orleans. Some levees were in need of repair before the hurricane struck. Others had been built with materials that couldn't withstand a big storm. The levees were weakened as a result.

Army helicopters dropped sandbags to plug the levees. Each sandbag weighed about 7,000 pounds. The army placed about 600 of them each day for ten days. It did that until the levees stopped overflowing. The estimated eventual cost of rebuilding the levees is \$10 billion.



# THE COST OF CLEANUP

It is estimated that the total economic losses from Hurricane Katrina may exceed \$200 billion. The hurricane damaged 30 oil rigs in the Gulf of Mexico. Oil production in the U.S. was reduced by 25 percent. More than one million acres of forest were destroyed. This caused \$5 billion worth of damage.

More than a million people in Louisiana and Mississippi lost their homes and jobs. Most had to move to other cities. They had to start their lives over. By January 2006, about 200,000 people had returned to New Orleans. This was less than half of the population before the hurricane. The cost of rebuilding the city's roads, sewers, water pipes, and electricity lines is estimated to be \$100 billion.

More than 150,000 refrigerators were emptied of rotting food. About 10,000 barrels of waste were collected. Dangerous chemicals had to be buried in a landfill.



## Help From Near and Far

About 60 countries gave aid to the United States following the hurricane. They offered money, food, supplies, and oil. They also provided doctors, soldiers, and **volunteers**. More than \$4 billion was donated by U.S. charities. People all over the country donated clothing and shoes.

September 4, 2005 THE DAILY TIMES

### Relief for Survivors

The Astrodome in Houston, Texas, has become a new home for 25,000 Hurricane Katrina survivors. A convoy of 500 buses transported people 350 miles from the Superdome in New Orleans to Houston. Relief workers have set up cots. They have arranged for catering, and have organized clothing.



Volunteer Berenice Suarez of Houston helps sort out shoes donated to the hurricane survivors.

# Global Warming

One of the biggest challenges faced by scientists and economists today is global warming. Scientists agree that the earth's atmosphere is getting warmer. Some believe this is a natural cycle. Others think it is caused by increased human activity.

Many scientists believe that global warming could be controlled. They believe we need to reduce our carbon dioxide **emissions** into the earth's atmosphere. This would mean cutting down fewer trees. It would mean planting **sustainable** forests. It would also mean using fewer oil products for transportation and industry. That presents a huge challenge for developed countries. After all, oil is used to supply two-thirds of the world's energy.



Trees are 50 percent carbon. About 34 million acres of trees are burned every year. This causes 25 percent of the world's carbon dioxide emissions.

Countries with growing economies, such as China and India, are also challenged by measures that reduce carbon dioxide emissions. These countries want living standards comparable to those of rich countries. To do so, they must increase their industry. To do that, they must use oil.

**KNOW THE SCIENCE**

## Signs of the Times

Scientists know that the earth's climate has changed gradually over the last 400,000 years. That information is seen in ice-core samples from Antarctica's ice sheet. The earth's temperature has increased by about 1°F in the last 100 years. This may not seem to be a bad thing. But if the temperature continues to increase, it will seriously affect life on the earth.

Other signs of global warming:

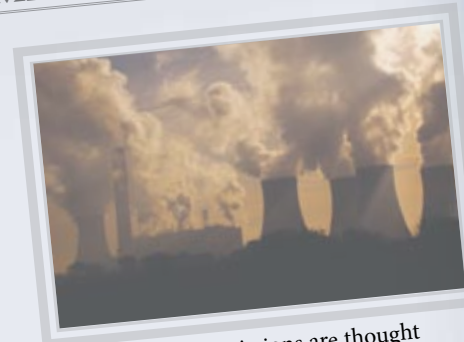
- increase in ocean temperatures
- glaciers melting and sea levels rising
- more extreme weather, such as hurricanes, floods, and droughts

February 16, 2005

THE DAILY TIMES

## Treaty in Place

The Kyoto Protocol treaty comes into force today. The agreement was proposed by the United Nations in 1997. So far, 141 countries have signed the treaty. Each country has a target to reduce its carbon dioxide emissions. The target is at least five percent less by 2012.

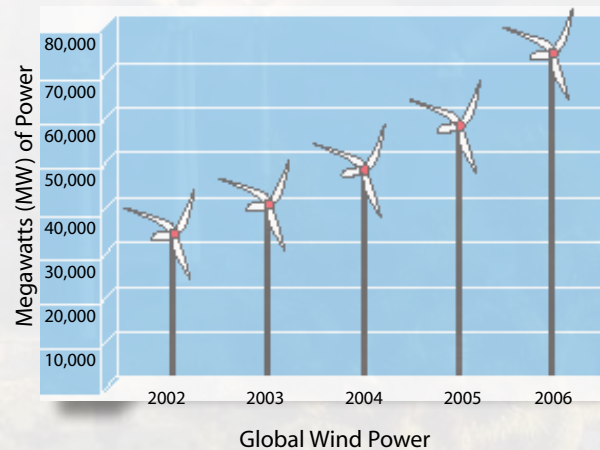


Carbon dioxide emissions are thought to be one of the causes of global warming.

# A Greener Future

Global warming still involves many unknowns. We do know, however, that global environmental changes will affect all of us. Reducing our human impact on the earth does not have to hurt the world's economies. Scientists and economists are working together to find solutions. It is likely that the sooner we respond to problems, the less costly the solutions will be.

The United States produces the most carbon dioxide emissions. It produces 25 percent of the world's total. Development of energy-efficient, or green, technologies has become an important branch of U.S. science research. These technologies include wind power and solar energy. Research is also being done into biofuels. Biofuels are made from plant or animal products. Developed countries can offer **incentives** to developing countries to improve their economies using green technologies. New jobs in sustainable industries can be created.



Wind power is one of the fastest-growing energy industries. Global wind power grew by more than 30 percent in 2006.

## Global Warming and Economies

### Advantages

- more crops will grow in colder countries
- some drought may ease

### Disadvantages

- winter sports will suffer
- flooding could occur
- more extreme weather will occur

## EFFECT ON ECONOMY

### Dollar Signs

Global warming has positive effects on the economy. It also has negative effects. In colder climates, more crops will grow. However, warmer winters are not good for cold-weather sports. If there is no snow, the ski industry will suffer. Similarly, increased rainfall may help some countries with water shortages. It is also good for some crops. But too much rainfall can cause flooding. This is costly to clean up.

Changing from gasoline to other forms of fuel will provide opportunities for new businesses. However, economies that depend on selling oil will lose income.

The effort to reduce carbon emissions led to the development of the hybrid car. A hybrid car has a small gas engine and an electric motor. These work at different times to power the car. The electric motor runs on a battery. The battery recharges while the car is driven. Hybrid cars produce 90 percent less pollution than normal cars.



Gas engine

Electric motor



Ecuador is a small country in South America. More than half of its 13 million inhabitants live in poverty. The country owes about \$18 billion in overseas debt. However, Ecuador has giant untapped oil fields. The fields could contain up to one billion barrels of oil. Ecuador would earn \$700 million a year if the area was developed. This industry would certainly help boost its economy.



But oil production would also cause tons of carbon dioxide pollution. The president of Ecuador has agreed not to **exploit** the oil fields, provided that developed countries agree to **finance** his economy. He is asking for \$350 million a year. This is half of what the oil fields would earn for the country. The forest that grows on top of the oil fields could then be preserved.

## WHAT DO YOU THINK?

Should developed countries pay Ecuador not to exploit its oil fields?

### PRO

I think the international community should give Ecuador compensation for not developing its oil fields. Ecuador is a small country. It needs to protect its forests. Oil usage in every country affects global warming. Everyone must be aware of the worldwide environmental costs.



### CON

Developed countries have their own economies to finance. I think Ecuador should generate money by planting sustainable forests and crops. It could also develop more solar power instead of using its oil resources.



Go to [www.eia.doe.gov/kids/energyfacts/sources/non-renewable/oil.html](http://www.eia.doe.gov/kids/energyfacts/sources/non-renewable/oil.html) to learn more about oil production.

- boom** a period of rapid growth
- contaminate** to make dirty or unfit for use
- crisis** (*KRYE siss*) a time of great hardship or danger
- diesel** (*DEE zuhl*) a fuel, made from oil, that is heavier than gasoline
- emission** (*ee MISH uhn*) something that is given off or discharged
- energy** power that makes machines work and produces heat
- exploit** (*ek SPLOIT*) to take advantage of someone or something
- export** to send goods to another country to be sold there
- finance** the management and use of money by banks, companies, and governments
- flammable** (*FLAM uh buhl*) easily set on fire
- geologist** a scientist who studies the rocks, minerals, and soil of the earth
- global warming** a gradual rise in the temperature of the earth's atmosphere
- gravity** the force that pulls objects toward the earth
- import** to bring goods into a country from another country
- incentive** something that encourages you to make an effort
- infect** to contaminate with a disease
- innovation** (*in uh VAY shuhn*) a new idea or invention
- levee** a natural or human-made bank built alongside a river to prevent flooding
- locomotive** an engine used to pull railroad cars on a track
- monopoly** the control of a product or service in a particular market
- pandemic** (*pan DEM ik*) a disease that spreads throughout a country, a continent, or the world
- share** a unit of stock that can be sold individually; an investor can own thousands or millions of shares in a stock
- sustainable** (*suh STAYN uh buhl*) able to be continued without long-term negative impact on the environment
- symptom** a sign of a condition, particularly an illness
- transcontinental** extending across a continent
- vaccine** (*vak SEEN*) a medicine that prepares the body to fight a future infection
- vibration** a very fast back-and-forth movement
- virus** a tiny organism that causes disease
- volunteer** a person who does a job without being paid

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Asian flu	21	levees	22–23
bird flu	18–21	New Orleans	22–25
carbon dioxide	16, 26–29, 31	oil barrels	14–15, 17, 30
global warming	16, 26–30	oil drilling	13
Hurricane Katrina	22–25	oil spills	16–17
James, Jesse	11	pandemics	20–21
jobs	11, 18, 24, 28–29	railroads	10–11
Kyoto Protocol	27	trains	8–12