Chapter 19: Technological Advances and Economics in the Global Age Chapter Introduction
Book Title: The Earth and Its Peoples: A Global History 7th Edition Update, AP® Edition
Printed By: James Harper (carter_mcquaid@roundrockisd.org)

Chapter Introduction

Overarching Questions

1. How did the development of new technologies change the world from 1900 to the present? (TEC)
2. How have environmental factors affected human populations over time? (GOV)
3. What were the causes and effects of environmental changes in the period from 1900 to the present? (ENV)
4. How did the global economy change and remain the same between 1900 and the present? (ECN)

AP® Framework Terms

nuclear power

birth control

vaccines

antibiotics

deforestation

greenhouse gases

Overarching Questions

In 1869, three Japanese businessmen—an entrepreneurial former cook, a green grocer, and a wagon builder—responded to government concerns about urban congestion and applied for a license to build a jinriksha (“man-power-vehicle”). They described it as “a little seat in the Western style, mounted on wheels so that it can be pulled about. It does not

shake as much as the usual cart, and it is easy to turn round. It will not hinder other traffic, and since it can be pulled by one person, it is very cheap." Their first vehicles, which quickly came to be called rickshaws, appeared a year later. A year after that, in 1871, Japan enacted its first patent law, and the three applied for exclusive manufacturing rights. However, so many workshops were by then turning out rickshaws that their application was denied.

An alternative claim of invention arose when an irascible American Baptist missionary named Jonathan Goble petitioned the Tokyo Metropolitan Government to grant him a share of the tax levied on the 30,000 rickshaws then officially registered. He claimed to be the inventor, and a number of Westerners living in Japan supported him, some stating that Goble had built the first rickshaw for his ailing wife, and others that he had designed it at the request of a Japanese officer for use in the "imperial pleasure gardens." The Japanese version of the story, which was reinforced in 1900 by government cash awards to the three businessmen, is highly credible since two-wheeled carts with a similar arrangement of shafts for pulling were in use on Japanese farms and for transporting loads well before European carriages came to be known through the "opening of Japan" in the 1850s. Moreover, Japan became the export source for rickshaws throughout Asia and the Indian Ocean region. The Goble story, however, made better sense to Westerners, who had a hard time crediting non-Europeans with inventiveness. People today often look back and marvel at the incredible material changes their parents and grandparents lived through in the twentieth century. Movies, radio, television, telephones, automobiles, and airplanes all developed during the first half of the century. Norms of daily life rooted in the nineteenth century gave way to new assumptions about many aspects of human life.

Yet many of these assumptions applied more to the industrialized countries of Europe and North America than to those parts of the world that before World War II consisted mostly of imperial possessions or, in the case of Latin America, politically independent countries whose economies were dominated by European or American businesses and investors. Automobiles may have changed dating habits in the United States, but not in China or India, where few private individuals owned cars. Telephones may have put people in easy contact with family and friends in Europe, but not in Africa, where imperialist economic interests saw no profit in stringing copper wire throughout the land. Only the decolonization after World War II and the end of the Cold War in 1989 took down the barriers to transfers of technologies around the world—along with global economic infrastructures and environmental costs. However, the new global economic infrastructure also heightened the environmental costs of growth.

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19-1a Transportation

According to one estimate, Constantinople, the capital of the Byzantine Empire, had a population of 200,000 in 1000 CE and was the only European city to be ranked among the world's ten largest cities. By 1500 Paris had joined Constantinople on the list, and by 1800 so had London. Beijing, the most populous city, then had over 1 million inhabitants, about twice as many as the largest city in 1000.

Industrialization deeply affected population distribution in the course of the nineteenth century. By 1900 all of the world's top ten cities were European or American except for Tokyo. The largest, London, had 6.4 million inhabitants. European dominance waned in the first half of the twentieth century. In 1950 Shanghai, Buenos Aires, Tokyo, and Calcutta (now Kolkata) were on the list, and 12.4 million people resided in the largest city, New York. Today, two European cities, Moscow and Istanbul (formerly Constantinople), make the top ten. Of the rest, four are in China and two in South Asia. Tehran (Iran) and Sao Paulo (Brazil) round out the list. New York is nineteenth. The largest city, Shanghai, has a population of 17.8 million.

In Asia and the Indian Ocean basin, the rickshaw contributed to this transformation of urban life just as streetcars had earlier done in Europe and America. Before 1850, Japanese civilians either walked or were carried in plain (kago) or fancy (norimono) palanquins, small seats or cabins suspended from poles carried on the shoulders of bearers. A palanquin required a minimum of two men, or more if the trip was long or the rider wanted to display his or her wealth. The rickshaw cut the expense of personal transport in half and doubled its speed because a rickshaw puller, unlike palanquin bearers, usually ran rather than walked. Rickshaw transport effectively enlarged the area of cities that had previously been scaled for pedestrian access, just as public transport made it possible for Bostonians and Londoners to live away from the city center. Rickshaws also avoided the plague of Western cities: horse manure.

The technical specifications of the first rickshaws have not survived, but the claim that "it does not shake a much as the usual cart" suggests that what made the vehicle a sensational success from the very start was the provision of leaf springs (arced steel strips bound at the ends to form an ellipse). The first leaf spring design had been pa-tented in England in 1804 and was probably in use on carriages imported into Japan in the 1850s. Early drawings and photographs of rickshaws consistently show them with leaf springs.

> AP® Exam Tip
>
> Compare the diffusion of technology from this time period to earlier time periods.

Japanese-made rickshaws stimulated the growth of big Asian cities like Shanghai, Beijing, Singapore, Calcutta, and Bombay and reached across the Indian Ocean to Madagascar and South Africa. Tens of thousands of unskilled workers flocked to these cities to become rickshaw pullers in the way that European villagers entered the urban economy by way of unskilled manufacturing jobs. Like European mill-hands, rickshaw pullers endured miserable living conditions and occasionally banded together in strikes, particularly in opposition to streetcar companies that threatened their livelihoods. However, streetcars could not deliver passengers directly to their homes or take children safely to school, so the rickshaws survived and evolved into the pedicabs and auto-rickshaws that are still common today.

First Aluminum Airplane

From the Wright Brothers' first aircraft in 1903 down to the air battles of World War I, wood, cloth, and wire made up the wings and bodies of airplanes. Metals were too heavy for anything but engines and weapons until German manufacturer Hugo Junkers designed the first aluminum flying machine, shown here, in 1917.

Museum of Flight Foundation/Getty Images

Chronology

Developments in Technology, Exchange, Society, and the Environment

1895	Lumiere brothers project the first motion picture in Paris
1900	London is the world's largest city with 6.4 million people
1903	Wright brothers fly first airplane Marie Curie wins Nobel Prize in physics for her work on radioactivity
1907	Bakelite, the first plastic, is invented
1908	Founding of Yasui Sewing Machine Company (later Brother Industries)
1912	First feature-length movie releases in India
1913	Henry Ford introduces assembly-line production
1916	Albert Einstein formulates relativity theory
1920	Commercial radio begins in United States
1923	Margaret Sanger opens first birth control clinic
1925	Commercial radio begins in Japan
1931	Settlement house champion Jane Addams wins Nobel Peace Prize
1932	Empire State Building opens
1955	Jonas Salk develops polio vaccine
1961	Jack Kilby and Robert Noyce invent the silicon chip
1962	Light-emitting diodes (LEDs) become basis of modern telecommunications

1970	First celebration of Earth Day
1979	Three Mile Island partial nuclear meltdown occurs
1986	Chernobyl nuclear reactor explodes
2007	First Apple iPhone popularizes smartphones worldwide
2010	China becomes world's second largest economy
2020	Shanghai is the world's largest city with 17.8 million people

The rickshaw provides a rare example of an Asian invention transforming urban life in ways unfamiliar to Europeans and Americans. The more frequently told stories focus on Western inventions like railroads and automobiles transforming the non-Western world. Yet even there, the innovations of the Industrial Revolution that imperialist governments and businesses exported to their colonies affected the non-Western world differently than later innovations that spread world-wide in the first half of the twentieth century. Whereas railroads and automobiles required steel mills and factories, other new inventions were comparatively inexpensive and adaptable to local customs.

Of all the innovations of the time, however, none attracted public interest more than airplanes. In 1903 two young American mechanics, Wilbur and Orville Wright (American bicycle mechanics; the first to build and fly an airplane, at Kitty Hawk, North Carolina, December 7, 1903. (p. 561)) , built the first aircraft that was heavier than air and could be maneuvered in flight. From that moment on, airplanes fascinated people. In 1911 a French pilot flew 6,500 letters from one city in British India to another 8.1 miles (13 kilometers) away, thus inaugurating the first important use of air transport. Military observation and aerial warfare came second. During the Great War the exploits of air aces relieved the tedium of news from the front, but no one anticipated the massive bombing raids of World War II.

The first flight of KLM Royal Dutch Airlines (Oldest major airline, operating since 1920 in Europe and connecting to the Dutch East Indies in 1929. (p. 562)) , the oldest continuously operating airline, took off in 1920. That year it carried 440 passengers and 22 tons of cargo. Scheduled service to a number of northern European cities soon followed. Its most important service, as an air link to the Dutch East Indies (now Indonesia), began in 1929. Every country with imperial possessions saw international air service as a political necessity. Two of the oldest airlines, however, Qantas in Australia and the German-owned

precursor of Avianca in Colombia, functioned entirely outside of Europe.

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19-1b Communication

Auguste and Louis Lumière (French inventors of motion pictures whose equipment demonstrations abroad stimulated the growth of cinema around the world. (p. 562)) projected the first motion pictures in Paris in 1895. The following year the brothers held demonstrations in Bombay, London, Montreal, New York, and Buenos Aires. Other exhibitors soon showed off the new medium in Johannesburg, Alexandria, and Tokyo. Unlike expensive innovations like automobiles and airplanes, motion pictures could be made cheaply using fairly inexpensive equipment. The idea of moving images appealed just as much to non-European audiences as it did to Europeans.

The first experiments with film in India appeared two years after the Lumières' visit. The first full-length feature, screening in 1912, told the story of a legendary Indian king from the classical Sanskrit epics. Movies also caught on quickly in Japan, which had a tradition of magic lantern displays. Local theatrical traditions like kabuki and bunraku influenced the style and content of the earliest films just as early European filmmakers concentrated on reproducing stage plays. Japanese films of the silent era were usually accompanied by spoken narration, as were the films the Japanese exported to Formosa (now Taiwan), a Chinese-speaking island that came under Japanese control in 1895.

American and European silent films found ready markets around the world, but non-Western filmmaking flourished in some countries. Moreover, the impact of film was not limited to entertainment. Documentary films and especially newsreels became major sources of information. Filmed news coverage of key political figures like Mahatma Gandhi in India played a major role in their success (see Diversity & Dominance: Gandhi and the Media in Chapter 18), especially after the advent of sound in the late 1920s.

Practical photography began in Europe in 1839, and forty years later an efficient way was developed for printing photographs in newspapers. Photographic images soon became common throughout the world, often as picture postcards. European photographers, however, tended to look upon Asians and Africans, particularly semi-nude women, as exotic subjects and thereby catered to common European assumptions about racial superiority.

Non-European photographers rarely became known outside their home countries. Nevertheless, they produced thousands of images that are now used to reconstruct history. Chinese newspapers and magazines usually published images without naming the photographers. A dozen early photographers became famous in Japan, however, possibly because popular woodblock prints had created an audience for artistic images of everyday scenes. In Iran, the most avid photographer was the ruler Naser al-Din Shah (r. 1848–1896). Despite Muslim clerical disapproval of making images of human beings, the shah

shot some 48,000 pictures, including members of his own family and even nudes and prisoners.

Lumière Brothers Camera

In this simple and lightweight early model, turning the crank caused the chain drive to pull the film in front of the lens from a roll suspended above the device. The larger the roll of film (not shown), the longer the resulting movie.

Science & Society Picture Library/Getty Images

Photography enabled newspapers, magazines, and advertisements to inform even illiterate people about what their country and their fellow citizens looked like, who was ruling them, and how traditional elites and prosperous Europeanized families lived. Thus photography contributed to feelings of national identity and common experience even in lands that were internally divided by language and ethnicity.

Radio had served ships and the military during the Great War as a means of point-to-point telecommunication. After the war, amateurs used surplus radio equipment to talk to one another. The first commercial station began broadcasting in Pittsburgh in 1920. By 1924, 600 stations were broadcasting news, sports, soap operas, and advertising to homes throughout North America. By 1930, 12 million families owned radio receivers. In Europe radio spread more slowly because governments reserved the airwaves for cultural and official programs and taxed radio owners to pay for the service.

Japan followed the North American model of commercial radio. The first AM station began broadcasting in 1925, and by 1941 there were almost fifty stations organized in two networks covering both the home islands and imperial possessions in Formosa (Taiwan), Korea, and Manchuria. Programming increasingly reflected the militarist tendencies of the

government, but it also included Japanese and classical Western music, English lessons, exercise programs, and tips for urban gardeners.

Radio development in Shanghai was also robust, with 100,000 receivers in use by 1936. Most were imported, but small local manufacturers contributed to the new fad. British authorities in India and Africa, on the other hand, established central control of radio transmissions and programming. French colonial administrations did likewise.

South Africa saw the first attempts at radio broadcasting in 1924, but these enjoyed very little success until the South African Broadcasting Corporation was established with monopolistic control over the medium in 1936. Down to World War II it broadcast only in English and Afrikaans. Most efforts in other colonies, such as Mozambique and Kenya, likewise targeted European listeners. The exception was British West Africa—Sierra Leone, Ghana, and Nigeria—where African languages were used. Rather than wireless service, subscribers had loudspeakers in their homes that were connected by wire to the radio station. After 1936 the British authorities generally began to see radio as a medium for reaching Africans who did not understand English.

Africa had almost no cinematic presence prior to World War II, apart from fourteen stereotype-filled Tarzan films made in Hollywood between 1918 and 1949. A few films were made for British and Afrikaner audiences in South Africa, but the French issued a decree in 1934 prohibiting the shooting of movies.

Rural Japan Before World War I

This village scene from Japan reflects the taste for landscapes and ordinary life typical of the earliest photographers in Japan, both European and Japanese. The popularity of such scenes in earlier colored woodcuts may have influenced the choice of such subjects.

Royal Photographic Society/Getty Images

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Royal Photographic Society/Getty Images

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19-1d Information Technology

> AP® Exam Tip
>
> Understand the effects of new technologies like the internet and cellular communication on the process of globalization.

Nuclear energy, jet engines, radar, and tape recording were among the many World War II developments that later had an impact on consumers' lives. New technology increased industrial productivity, reduced labor requirements, and improved the flow of information that made markets more efficient. The consumer electronics industry rapidly developed new products, changes seen in the music industry's movement from vinyl records to eight-track tapes, CDs, and then MP3 and other digital delivery technologies. Computers became faster, smaller, and less expensive, cell phones were transformed into smartphones, and the speed of news and data transmission accelerated at an unanticipated rate, transforming business, education, and politics globally.

Improvements in existing technologies accounted for much of the developed world's productivity increases during the 1950s and 1960s, as faster, more efficient transportation and communication cut costs and expanded markets. But new technologies were important as well. Governments bore much of the cost of developing and constructing nuclear power plants and sponsored research into new technologies. None has proved more influential in the last four decades than the computer, which has transformed both work and leisure (see Environment & Technology: Connected in Chapter 20). The first computers were expensive, large, and slow, and only corporations, governments, and universities could afford them. Each new iteration of computer technology has been smaller, faster, and less expensive. As a result, the serial utilization of desktops, laptops, tablets, and smartphones transformed commerce, education, and government. Today the computational capacity of a 1970s university mainframe computer can be found on the smartphone or tablet of individual university students. The modern smartphone may prove to be the most revolutionary innovation in this ongoing transformation and integration of communication, computation, research, and entertainment.

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19-1e Women's Lives

> AP® Exam Tip
>
> Evaluate the changes in gender roles and both the changes and continuities from previous time periods.

Women's lives changed more rapidly in the 1920s than ever before. Although the end of the war saw the end of wartime job opportunities, some women remained in the workforce. The young and wealthy enjoyed more personal freedoms than their mothers had before the war; they drove cars, played sports, traveled alone, and smoked in public. For others, the upheavals of war brought more suffering than liberation. Millions of women had lost their male kin in the war or in the great influenza epidemic. After the war many single women led lives of loneliness and destitution.

In Europe and North America advocates of women's rights had been demanding the vote for women since the 1890s. New Zealand was the only nation to grant women the vote before the twentieth century. Women in Norway were the first to obtain it in Europe, in 1915. Russian women followed in 1917, and Canadians and Germans in 1918. Britain gave women over age thirty the vote in 1918 and later extended it to younger women. The Nineteenth Amendment to the U.S. Constitution granted suffrage to American women in 1920. Women in Turkey began voting in 1934. Everywhere, their influence on politics was less radical than feminists had hoped and conservatives had feared. Even when it did not transform politics and government, however, the right to vote was a potent symbol.

> AP® Exam Tip
>
> Evaluate how more effective forms of birth control impacted gender roles.

Women were active in many other areas besides the suffrage movement. On both sides of the Atlantic women participated in social reform movements to prevent mistreatment of women and children and of industrial workers. In the United States such reforms were championed by Progressives like Jane Addams (1860–1935), who founded a settlement house in a poor neighborhood and received the Nobel Peace Prize in 1931. In Europe reformers were generally aligned with Socialist or Labour Parties.

Among the most controversial, and eventually most effective, of the reformers were those who advocated contraception, such as the American Margaret Sanger (1883–1966). Her campaign brought her into conflict with many authorities, who equated birth control with pornography. Finally, in 1923 she founded a birth control clinic in New York. In France, the government prohibited contraception and abortion in 1920 in an effort to increase the

birthrate and make up for the loss of so many young men in the war.

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19-1f Health and Medicine

Health and hygiene were part of the cult of modernity. Advances in medicine—some learned on the battlefield—saved many lives. Wounds were regularly disinfected, and Marie Curie (Polish-born Pioneer in the study of radiation and winner of Nobel Prizes for physics (1903) and chemistry (1911); first female professor at the Sorbonne. (p. 565)) (1867–1934), the French discoverer of x-rays, organized radiology vans to help army doctors diagnose fractures during the Great War. Cities built costly water supply and sewage treatment systems. By the 1920s indoor plumbing and flush toilets were becoming common even in working- class neighborhoods.

Interest in cleanliness entered private life. Doctors and home economists bombarded women with warnings and advice on how to banish germs. Soap and appliance manufacturers filled women's magazines with advertisements for products to help keep homes and clothing spotless and meals fresh and wholesome. The decline in infant mortality and improvements in general health and life expectancy in this period owe as much to the cult of cleanliness as to advances in medicine.

Section Review

- Rickshaws transformed the transportation systems of cities in East Asia, South Asia, and the Indian Ocean littoral.
- Cinema spread rapidly outside Europe and incorporated local performance traditions.
- Photography also spread, both for artistic expression and for newspaper and magazine articles and advertisements.
- Radio developed commercially in Japan, as it did in the United States; but in most European colonies it was controlled by the government.
- After the Wright brothers' first flight, mail delivery and connection with colonies prompted the organization of airlines.
- In many countries, women gained the right to vote and led reform movements.
- The cult of cleanliness improved health.

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19-1f Health and Medicine

Health and hygiene were part of the cult of modernity. Advances in medicine—some learned on the battlefield—saved many lives. Wounds were regularly disinfected, and Marie Curie (Polish-born Pioneer in the study of radiation and winner of Nobel Prizes for physics (1903) and chemistry (1911); first female professor at the Sorbonne. (p. 565)) (1867–1934), the French discoverer of x-rays, organized radiology vans to help army doctors diagnose fractures during the Great War. Cities built costly water supply and sewage treatment systems. By the 1920s indoor plumbing and flush toilets were becoming common even in working- class neighborhoods.

Interest in cleanliness entered private life. Doctors and home economists bombarded women with warnings and advice on how to banish germs. Soap and appliance manufacturers filled women's magazines with advertisements for products to help keep homes and clothing spotless and meals fresh and wholesome. The decline in infant mortality and improvements in general health and life expectancy in this period owe as much to the cult of cleanliness as to advances in medicine.

Section Review

- Rickshaws transformed the transportation systems of cities in East Asia, South Asia, and the Indian Ocean littoral.
- Cinema spread rapidly outside Europe and incorporated local performance traditions.
- Photography also spread, both for artistic expression and for newspaper and magazine articles and advertisements.
- Radio developed commercially in Japan, as it did in the United States; but in most European colonies it was controlled by the government.
- After the Wright brothers' first flight, mail delivery and connection with colonies prompted the organization of airlines.
- In many countries, women gained the right to vote and led reform movements.
- The cult of cleanliness improved health.

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19-2a The New Social Sciences

The new social sciences were more understandable, and thus more unsettling, than the new physics, for they challenged Victorian morality and middle-class values. Sigmund Freud (Austrian psychiatrist, founder of psychoanalysis. He argued that psychological problems were caused by traumas, especially sexual experiences in early childhood, that were repressed in later life. His ideas caused considerable controversy among psychologists and in the general public. Although his views on repressed sexuality are no longer widely accepted, his psychoanalytic methods are still very influential. (p. 566)) (1856–1939), a Viennese physician, developed the technique of psychoanalysis to probe the minds of his patients. His technique uncovered hidden layers of emotion and desire repressed by social restraints. "It is during this [childhood] period of . . . latency that the psychic forces develop which later act as inhibitions on the sexual life, and narrow its direction like dams. These psychic forces are loathing, shame, and moral and esthetic ideal demands," he declared. Meanwhile, sociologists and anthropologists had begun the empirical study of societies, both Western and non-Western. Before the war French sociologist Emile Durkheim (1858–1917) had come to the then shocking conclusion that "there are no religions that are false. All are true after their own fashion."

> AP® Exam Tip
>
> Consider the globalization of science, technology, and art.

If the words primitive and savage applied to Europeans as well as to other peoples, and if religions were all equally "true," then what remained of the superiority of Western civilization? Cultural relativism, as the new approach to human societies was called, could be as unnerving as relativity in physics; but for many it stimulated a tenacious desire to cling to the old truths.

The arts became a battlefield for confronting traditional values with new images and rhythms. Cubism, an approach to painting and sculpture that sought to go beyond realism and depict many aspects of an image simultaneously, aroused lively debates in the 1910s. A painter like the Spaniard Pablo Picasso (Key figure in the movement of modern art away from realistic representation; a founder of cubism and surrealism. (p. 566)) (1881–1973) changed his nonrealistic style of painting time and again over his long career. Paralleling his audacity in the field of music, Russian composer Igor Stravinsky (Influential modernist composer known for his experimentation and pulsing rhythms. (p. 566)) (1882–1971) incorporated so-called primitive rhythms in his ballet The Rite of Spring, which debuted in 1913.

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19-2c The Demographic Transition

The population of Europe almost doubled between 1850 and 1914, putting enormous pressure on rural land and urban housing and overwhelming fragile public institutions that provided crisis assistance. This dramatic growth forced a large wave of European immigrants across the Atlantic, helping to develop the Western Hemisphere and invigorating the Atlantic economy. Population growth also contributed to Europe's Industrial Revolution by lowering labor costs and increasing consumer demand.

While some Europeans saw the rapid increase in human population as a blessing, others warned of disaster. The best known of these pessimists was English cleric Thomas Malthus (Eighteenth-century English intellectual who warned that population growth threatened future generations because, in his view, population growth would always outstrip increases in agricultural production. (p. 566)) , who in 1798 argued that unchecked population growth would outstrip food production. When Malthus looked at Europe's future, he used a prejudiced image of contemporary China to terrify his readers. A visitor to China, he claimed, "will not be surprised that mothers destroy or expose many of their children; that parents sell their daughters for a trifle; . . . and that there should be such a number of robbers. The surprise is that nothing still more dreadful should happen."

Chinese Family-Planning Campaign

To slow population growth, the Chinese government sought to limit parents to a single child, but has relented in the recent past when the economic consequences of a rapidly aging population became clear. Billboards and other forms of mass advertising were an essential part of the original campaign to suppress fertility.

Richard Greenhill/Alamy Stock Photo

Sally and Richard Greenhill/Alamy Stock Photo

The intensifying global connections of large amounts of people revealed a very different danger than malnutrition. Not only lack of food but now infectious disease emerged as a deadly threat to human populations. Large troop concentrations and troop movements around the world, often in tight and under-ventilated modes of housing and transportation, helped spread the influenza virus at the end of World War I (see Chapter 15). Almost the entire global population became infected with the virus. More Americans (approximately 500,000) died from the flu between 1918 and 1919 than in the war, and worldwide the influenza pandemic took 20 million lives.

Poverty continued to promote the spread of diseases in the twentieth century, especially in Asia, Africa, and Latin America. The mosquito-borne infectious malaria fever of the tropical regions posed a particular risk to people working outdoors and in fields. While Latin Americans in the Andes region had been familiar with quinine as an antimalaria drug since at least the seventeenth century, the most significant advances against the disease came in the early twentieth century. Engineers overseeing the construction of the Panama Canal observed the impact of simple public health measures such as the use of mosquito nets and drainage of stale water pools, for instance. More recently, the Chinese researcher Tu Youyou developed a new anti-malarial drug on the basis of traditional Chinese medicine, earning her a Noble Prize in 2015.

Also prevalent in conditions associated with poverty and limited access to hygiene has been cholera, a bacterial gastrointestinal disease with such severe diarrheic symptoms that it can come with death rates between 5 and 50 percent. Now rare in industrialized nations, it has long afflicted populations without access to safe drinking water.

Still, the generation that came of age in the years after World War II lived in a world where Malthus seemed to have little relevance. Industrial and agricultural productivity had multiplied supplies of food and other necessities. At the same time, cultural changes associated with expanded female employment, older age at marriage, and more effective family planning had slowed the rate of population increase. By the 1960s Europe and other industrial societies had made the demographic transition (A change in the rates of population growth. Before the transition, both birthrates and death rates were high, resulting in a slowly growing population; then the death rate dropped but the birthrate remained high, causing a population explosion; finally, after the transition, the birthrate dropped and population growth slowed down. This is the situation today in the wealthiest modern industrial economies. (p. 567)) to lower fertility rates (average number of births per woman) and reduced mortality. This meant that populations would age quickly. In the world's most developed nations, for example, median age rose from twenty-nine years in 1950 to thirty-

seven years by 2000.

By the late 1970s, the developing world had still not experienced the demographic transition and the global discussion of population growth became highly politicized. Leaders in some developing nations actively promoted large families, arguing that larger populations increased national power. When industrialized nations, mostly white, raised concerns about rapid population growth in Asia, Africa, and Latin America, populist political leaders in these regions responded by asking whether these concerns were racist.

This question exposed the influence of racism in the population debate and temporarily disarmed Western advocates of birth control. However, once the economic shocks of the 1970s and 1980s had revealed the economic vulnerability of poor nations, governments in the developing world jettisoned policies that promoted population growth and began to advocate birth control. Mexico is a good example. In the 1970s the government had encouraged high fertility, and population grew an average of 3 percent per year. In the 1980s Mexico rejected these policies and began to promote birth control, leading by the 1990s to a more manageable annual population growth of 1.7 percent.

World population exploded in the twentieth century, more than doubling between 1950 and 2000 (see Table 19.1). Although the rate of growth has slowed since the 1980s, world population still increases by a number equal to the total population of the United States roughly every three to four years. If fertility had remained constant from the 1990s, with a world average of roughly 2.5 children per woman, population would reach nearly 27 billion in 2100. This will not happen, however, because fertility is declining in most developing nations and is at less than replacement levels in most industrialized countries. In Iran, for example, the average number of children born to each woman dropped from more than six to less than three in the single decade 1986–1996. As a result, most experts estimate a world population in 2050 of around roughly 10 billion.

Table 19.1

Population for World and Major Areas, 1750–2050

	Population Size (Millions)						
Major Area	1750	1800	1850	1900	1950	2000	2050 *
World	791	978	1,262	1,650	2,521	6,055	9,725
Africa	106	107	111	133	221	785	2,478

	Population Size (Millions)						
Major Area	1750	1800	1850	1900	1950	2000	2050 *
Asia	502	635	809	947	1,402	3,683	5,267
Europe	163	203	276	408	547	729	707
Latin America and the Caribbean	16	24	38	74	167	519	784
North America	2	7	26	82	172	310	433
Oceania	2	2	2	6	13	30	57
	Percentage Distribution						
Major Area	1750	1800	1850	1900	1950	2000	2050 *
World	100	100	100	100	100		100
Africa	13.4	10.9	8.8	8.1	8.8	13.0	25.5
Asia	63.5	64.9	64.1	57.4	55.6	60.8	54.2
Europe	20.6	20.8	21.9	24.7	21.7	12.0	7.3
Latin America and the Caribbean	2.0	2.5	3.0	4.5	6.6	8.6	8.1

	Population Size (Millions)						
Major Area	1750	1800	1850	1900	1950	2000	2050 *
North America	0.3	0.7	2.1	5.0	6.8	5.1	4.4
Oceania	0.3	0.2	0.2	0.4	0.5	0.5	0.6

Sources: J. D. Durand, "Historical Estimates of World Population: An Evaluation" (Philadelphia: University of Pennsylvania, Population Studies Center, 1974, mimeographed); United Nations, The Determinants and Consequences of Population Trends, vol. 1 (New York: United Nations, 1973); United Nations, World Population Prospects as Assessed in 1963 (New York: United Nations, 1966); United Nations, World Population Prospects: The 2015 Revision (New York: United Nations, 2015); United Nations Population Division, Department of Economic and Social Affairs, World Population to 2300 (2004).

In industrialized nations life expectancy improved as fertility declined. The combination of human lives. In 2000 about 20 percent of the population in Europe was age sixty-five or over. By 2050 this proportion will rise to over one-third. Italy soon will have more than twenty adults fifty years old or over for each five-year-old child. Because of higher fertility and greater levels of immigration, the United States is moving in this direction more slowly than western Europe; by 2050 the median age in Europe will be fifty-two, while it will be thirty-nine in the United States.

The combination of falling fertility and rising life expectancy in the industrialized nations presents a challenge very different from the one foreseen by Malthus. These nations generally offer a broad array of social services, including retirement income, housing supplements, and medical services for the elderly. In fact, the central factor in the growing healthcare costs of developed nations is the longevity of its population and its exposure to illnesses that occur far more frequently in age—heart disease, Alzheimer's disease, and cancer.

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19-2d Pandemics, Medicine, and Public Health

Birth rates are not the only factors in global demographic trends; mortality rates have increased in some regions as immigration, commercial expansion, and improved transportation have facilitated the transmission of disease. The highly lethal infectious Ebola virus has periodically caused widespread global alarm since it first appeared in Central Africa in 1976. Its deadliest outbreak, between 2013 and 2016, killed at least 11,000 people in West Africa, but the region's relative isolation and the virus's high mortality rate have largely kept Ebola from becoming a global pandemic.

> AP® Exam Tip
>
> Consider the role of medical advancements such as antibiotics and of epidemic diseases such as HIV/AIDS on demographics in the twentieth and twenty-first centuries.

The rapid spread of HIV/AIDS before the recent development of revolutionary treatments is an example of a different phenomenon. Since the beginning of the epidemic 70 million people have been infected with HIV and roughly 35 million have died. Less developed regions with poorly funded public health institutions and with few resources to invest in prevention and treatment experience the highest rates of infection and the greatest mortality. Of the countries with the highest HIV/AIDS rates, thirty-seven are in Africa, three in Asia, and six in Latin America and the Caribbean. These countries were home to 87 percent of all HIV/AIDS infections. In recent years, prevention programs and much improved drug therapies have slowed both mortality and infection rates, with the greatest successes registered in rich countries with the greatest medical resources. Sub-Saharan Africa, with roughly 70 percent of the world's cases, remains the center of the epidemic in 2016, but the epidemic has persisted in other regions as well, with approximately two million cases found in Latin America and the Caribbean and another one million found in Russia.

Since fall 2019, a highly contagious, versatile, and aggressive strand of coronavirus disease (COVID-19) caused by severe acute respiratory syndrome (SARS) has reminded populations and governments around the world of the public health challenges posed by a globalized economy with highly mobile populations. In a little over a year, a handful of cases —traced back to contact with bats at a live animal market in the city of Wuhan, China—had mushroomed to more than 105 million cases and more than 2 million deaths worldwide by early February 2021. Unlike in previous outbreaks, infection and death rates from the coronavirus were not simply a matter of a nation's wealth, but more specifically of coordinated and timely public health measures. Notably the United States and United Kingdom, two nations whose recent governments have rejected international institutions and

science-based bureaucracies, stood out with death tolls and rates otherwise found in Latin America, a region with far fewer financial resources to combat the disease. The United States alone reported more than 450,000 deaths by early February 2021. By December 2020, several pharmaceutical corporations had developed vaccines ranging in effectiveness from 50 to 90 percent. At the beginning of the new year, the speedy, efficient, and equitable distribution of the vaccine remained a problem in many parts of the developing and industrialized world.

Aside from the personal injury and cost of disease, not to mention death, pandemics pose a global challenge for humanity because of their debilitating impact on local, regional, and global economies: commerce; travel; social life; culture; and education. Even nations with effective public health policies have seen their economies slide into deep recessions, causing unemployment and poverty amongst the most vulnerable.

Most expectations center on the development of a vaccine. The worldwide confidence in the ability of scientists to develop an effective remedy against the disease speaks to another trend in twentieth-century science and medicine—vaccinations. The Chinese demonstrated an early form of inoculation, called “variolation,” that helped curtail smallpox after the conquest of Beijing back in 1644. Jesuits brought the practice to Europe where inoculation was developed further without the significant risk associated with the original method (exposure to the actual virus). Since the 1800s, vaccination campaigns with a less dangerous method developed by Edward Jenner (1749–1823), which involved using the “cowpox” virus to inoculate against smallpox, have spread across the globe. Louis Pasteur’s (1822–1895) technique of using dead disease agents for vaccination protected against anthrax and rabies. Maurice Hilleman (1919–2005) subsequently developed vaccinations against measles, mumps, hepatitis A and B, chickenpox, meningitis, pneumonia, and an influenza strain over the course of the twentieth century. In 1955, Jonas Salk’s (1914–1995) development of the polio vaccine was celebrated as the defeat of one of the last viral epidemics instilling fear not just in the developing world but in middle-class families of developing countries, since its victims were mainly children.

Section Review

- Social scientists such as Sigmund Freud undermined the old certainties of European culture by revealing a dark side to human nature.
- Max Planck and Albert Einstein led a revolution in physics.
- In the twentieth century the developed nations made the demographic transition to low birthrates, while the developing nations began by stressing higher birthrates.
- A more globalized world has made the spread of diseases easier. At the same time, scientific advances have generated vaccines and antibiotics that have

saved millions of lives.

Medicine did not only advance in the field of vaccinations but also in the development of antibiotics. In 1928, Scottish scientist Alexander Fleming (1881–1955) discovered that a group of antibiotics derived from common molds could kill bacterial infections. Penicillin first came into widespread use during World War II when pharmaceutical companies developed the means for its mass production. Antibiotics have proliferated since then and prevented many deaths. At the same time, however, the overuse of antibiotics has significantly increased bacterial resistance against this medication, once again leaving a growing number of people vulnerable to more aggressive strands.