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A Century of Productivity Improvement: Revolution in American Living Standards

... the frontier has often been described as one big rural slum saved only by the fact that the open spaces were not far away....
Furnas [1969, p. 261]

3.1 Introduction

In the last 100 years American economic growth and productivity gains have been so great that they elude intuitive grasp. The average American's scale of living has risen to a level undreamed of a century ago. In the mid-1800s U.S. per-capita output has been estimated to have been similar to that in such present-day less developed countries as Honduras and the Philippines, and slightly below that in China, Bolivia, and Egypt. Since then the real value of the goods and services available to an average American is calculated to have risen by an astonishing 700%.[1] These developments helped an extraordinarily high percentage of Americans to achieve what in the nineteenth century would have been considered an incredible standard of living. The amenities of life that almost all of us take for granted today—including electricity, indoor plumbing, safe public water and sewage systems, instant mass communications, access to technologically sophisticated medical care, a remarkable variety of fresh and ingeniously packaged foods from around the nation and the world, free public education, low infant mortality, and long life expectancy—were all virtually absent a century ago.[2]

In this chapter we seek to describe in some detail how economic growth transformed American life.[3] By comparing today's living conditions with those that prevailed in the nineteenth century (and earlier), we hope to bring to life the striking but abstract statistics on productivity and output gains discussed in this book. We shall touch on a broad range of activities

and conditions—including housing, diet, working conditions, incomes and family budgets, public health, longevity and physical stature, transportation, education, leisure time, and consumer goods—and draw upon a wide variety of sources of evidence—vital statistics in U.S. Census reports, personal oral histories, hypothetical "typical" budgets produced by newspapers and magazines, genealogical records and mail-order catalogues, diaries and journals of foreign visitors, and broad-ranging sociological and historical studies.

Of course, most readers are aware, as we were when we embarked on this research, that the American standard of living has improved greatly since the 1800s. Still, the enormous magnitude of the change may come as a surprise. Nineteenth-century America of popular literature and film is often shown in a romantic light, peopled by robust, hardworking, but ultimately prosperous pioneers, or members of polite Victorian society in the established towns and cities of the East, the picture marred only occasionally by glimpses of poverty in the backwoods and tenements. But for much of the nineteenth century the reality of life for the great majority of the population was unrelieved drudgery and deprivation. Average incomes were abysmally low (far below any modern standard of poverty), providing only the bare necessities of life. The state of medical care and public health was appalling—great epidemics of deadly disease were commonplace and infant mortality cruelly high—and the average life expectancy of a person born midcentury was only 40 years. Cities were unsanitary, crowded places where smokestack industries were beginning to foul the air. In the countryside people lived and worked in conditions that would not have been unfamiliar in the Middle Ages. Most families were housed in places affording no privacy or any of the most basic amenities. Men, women, and, often, children worked long hours to secure this scale of life, and vacations or retirement for the elderly were unheard of. As we shall see, the reality of the change in American life in the last century is even more startling than the statistics on economic growth suggest.

3.2 Life in the Nineteenth Century: Overview

In the mid-1800s the United States, with a total residential population of about 32 million, was predominantly a rural, agricultural nation. Fully half the workforce was involved in the most basic task of feeding the population (Beniger [1986]). Only one-eighth of the population lived in "cities" of 8,000 or more; 44% of the country's citizens lived on farms, and perhaps half of those dwelt in log cabins of one or two rooms (Martin [1942, p. 106]). Today, in contrast, less than 4% of the labor force is employed in agriculture and nearly three-quarters of the population live in areas classified as urban (U.S. Department of Commerce, Bureau of the Census [1982, pp. 21, 375]).

There seems no better way to get a sense of the pace and scale of life in the 1800s than to read some first-hand accounts from that time. In this chapter, we present a few such descriptions of nineteenth-century American life. In the account that follows, living conditions of a rural "mechanic's"[4] family in Pennsylvania during the latter quarter of the nineteenth century through the early part of the twentieth are described by a daughter, Nettie, in an oral history compiled by Peggy Heim [1985]:

> [The family] lived far out in the country [where] the nearest villages were 7 and 10 miles away in opposite directions [and] neighbors lived far apart. They built their house by hand and made most of their own tools [and had to dig their well by hand, using pick and shovel]. . . . The father made his livelihood as a skilled laborer, and the family had 16 acres for a garden, a field each of wheat and corn, and some fruit trees. They had no horse, no carriage, no wagon; there was no public transportation. . . . The children walked 5 miles each way . . . to the one-room school house. The father walked 7 miles each way to pay his taxes. . . . They raised pigs and chickens [and] shot rabbits, squirrels, game birds, and deer to increase their meat supply. . . . They had to borrow a horse to plow the field; the rest of the [farm] work they did by hand—with such hand-made tools as spade, hoe, clod-hopper, hand-pushed tiller, hand-pulled sled, and wheelbarrow. Their house had no indoor plumbing. Water had to be pumped, carried by bucket to where they used it, and carried out again after use for disposal. They dipped their hot water from a bucket on the stove. They washed their hands under the pump, and washed themselves in a basin of water. A more thorough basin-washing was their bath. The house had no closets. Clothes lay in hand-made chests or hung on wooden pegs from doors and walls. Since they had only a few changes of clothes, a few pegs each sufficed. They warmed the house with a wood stove, which also provided the heat for cooking. Except for the room with the stove, the rooms were cold in winter. They sat, cooked, ate and worked in one room; and the five of them slept in another. For their firewood, they had to chop down a tree in the near-by forest, drag it in on a hand-pulled sled, chop it into stove lengths, stack it, and then carry the wood into the house when they wanted to use it. They had to grow or raise almost all their own food or find it in the wild. They raised many root crops, like potatoes, turnips, and beets, or other vegetables, like cabbage, which kept well in a root cellar over the winter. To have additional food for winter, they spent many hours preserving fruits and vegetables. They dried grapes and sliced apples for pies, peas and beans for stews and soups. . . . In the late winter and early spring they dug dandelion roots and crowns, gathered their tender leaves, and cooked greens of wintercress, pokeweed and wild mustard. They made their tea from the dried leaves of wild plants—mint, comfrey, and pennyroyal. They ground dandelion roots, which when boiled made a passable native coffee. The daughters had

Table 3.1
Average income for 397 Massachusetts families of wage earners in 15 cities and 21 towns, 1874–1875

Average money income ($)	763
Average family size	5.1
Average expenditures for goods and services ($)	
Subsistence (food)[a]	427
Clothing	106
Rent	117
Fuel	44
Sundry expenses[b]	44

Source: U.S. Department of Commerce, Bureau of the Census [1975, pp. 320, 322], which cites Massachusetts Bureau of Statistics of Labor, *Sixth Annual Report*, March 1875, Public Document No. 31, pp. 221–354, 372, 373, 441. Figures are in current dollars.
a. Includes kerosene.
b. Some specified sundries included furniture, carpets, books and papers, societies and religion, charity, sickness, care of parents, care of house, recreation, housegirl, travel to work, and life insurance.

to stop school after 8th grade; the family couldn't pay the board and public school fees in town. They could read and comprehend quite well—though they had little around to read.

Rural life in the 1800s, then, was not easy. Nevertheless, life in urban America was often even worse. As Heim writes in her account of Nettie's life [1985, p.11], "They worked hard, and their life was far from easy. But compared with factory workers and day laborers of that era, their level of living and comfort was noticeably higher than their urban counterparts, for they had outdoor space, healthful environment, a varied and sufficient diet, diverse activities, and some control over their use of time and the way they expended effort. If they had had no land, had been unable to raise pigs and chickens, and had only a miniature garden, their life would have been far less satisfactory."

3.3 Family Budgets: Subsistence in the Nineteenth Century

In the mid-nineteenth century most American families spent nearly every dollar on the basic requirements of life: food, clothing, and shelter, obviously leaving little for medical care, education, entertainment, and so on. For example, a survey in 1874–1875 of wage-earners' families in urban Massachusetts (table 3.1) found that an average family of five spent fully

Table 3.2
Workingman's budget, Philadelphia, 1851

Item of expenditure	Amount ($)
Butcher's meat (2 lb. a day)	72.80
Flour (6½ bbl. a year)	32.50
Butter (2 lb. a week)	32.50
Potatoes (2 pk. a week)	26.00
Sugar (4 lb. a week)	16.64
Coffee and tea	13.00
Milk	7.28
Salt, pepper, vinegar, starch, soap, soda, yeast, cheese, eggs	20.80
Total expenditures for food	221.52
Rent	156.00
Coal (3 tons a year)	15.00
Charcoal, chips, matches	5.00
Candles and oil	7.28
Household articles (wear, tear, and breakage)	13.00
Bedclothes and bedding	10.40
Wearing apparel	104.00
Newspapers	6.24
Total annual expenditures	538.44

Source: Martin [1942, p. 394], who cites *New York Daily Tribune*, May 27, 1851. Figures are in current dollars.

91% of its income on these needs. In another budget from 1851, reproduced by Edgar Martin [1942], the "typical" Philadelphia workingman's family spent 41% of its budget on food alone, and 97% on food, clothing, and shelter (see table 3.2). A "Standard Workingman's Budget" for New York City in 1853 (table 3.3) devoted 46% to food and 92% to the combined needs of food, clothing, and shelter.

In contrast, as early as 1950 an average urban family of 3.4 persons was spending 31% of its after-tax income on food, and only 68% on food, clothing, and shelter (table 3.4). The Bureau of Labor Statistics' hypothetical average budgets for lower-, intermediate-, and higher-income families in 1978 devoted, respectively, 58%, 54%, and 51% of family income to food, clothing, and shelter (see table 3.5), and as table 3.6 shows, between 1888 and 1961 average family expenditures on food and drink fell from 44% to 27%.

Table 3.3
Standard workingman's budget, New York City, 1853

Item of expenditure	Amount ($)
Groceries	273
Rent	100
Clothing, bedding, etc.	132
Furnishings	20
Fuel	18
Lights	10
Taxes, water, commutation	5
Physicians' and druggists' charges	10
Traveling	12
Newspapers, postage, library fees	10
Church, charity, etc.	10
Total annual expenditures	600

Source: Martin [1942, p. 395], who cites *The New York Times*, November 8, 1853. Figures are in current dollars. Martin writes that even these minimal budgets "represent a scale of living which must have been out of reach of the great majority of working-class families" [p. 396].

In New York City in the mid-1800s not even 1% of the population earned as much as $850 (roughly the equivalent of $7,000 1980 dollars). In most parts of the country the average laborer earned only $250–400 a year (or about $2,000–3,500 in 1980 dollars), while skilled workmen did very well to make $700 a year (less than $6,000 in 1980 dollars).[5] Even the highest of these incomes is below the U.S. government's official 1980 poverty line of $8,400 (for a family of four persons), not taking account of all the noncash benefits such as food stamps, Medicaid, and public housing that most low-income persons receive today, all of which were absent in the 1800s.[6]

3.4 Food Consumption

These days, not only do Americans spend a much smaller proportion of their incomes on food, but they have a vast cornucopia of food products from which to choose. Today's supermarket, with its 8,000 items (Lebergott [1984, p. 68]), includes fresh fruits and vegetables transported across the country year-round, frozen, canned, and freeze-dried produce, and other items packaged to assure safety and wholesomeness.

Table 3.4
Consumption expenditures of 7,007 city wage- and clerical-worker families of 2 or more persons, 1950

Average annual income after taxes ($)	3,923
Average family size	3.4
Average expenditures for current consumption ($)	
Food	1,205
Alcoholic beverages	70
Tobacco	79
Housing	415
Fuel, light and refrigeration	163
Household operation	155
Furnishing and equipment	278
Clothing	453
Transportation	
Automobile	472
Other	69
Medical care	200
Personal care	91
Recreation	177
Reading	34
Education	17
Miscellaneous	47

Source: U.S. Department of Commerce, Bureau of the Census [1975, p. 320]. Figures are in current dollars.

In the mid-nineteenth century low incomes, local weather conditions, crop cycles, an almost complete lack of refrigeration, and very limited transport of goods bound a very large part of the population to a minimal and nutritionally inferior variety of foods—potatoes, lard,[7] cornmeal, and salt pork were consumed in large quantities, particularly outside the population centers. Most travelers' accounts of meals in nineteenth-century America lament the ubiquity of some kind of one-pot stew. Ruth Schwartz Cowan [1983, page 38] writes, in a historical study of household practices,

> That meal, the stew, symbolizes the very simple standard of living that most Americans (and, indeed, most Europeans) maintained in the centuries prior to industrialization. Everyday meals were uncomplicated and monotonous; much of the food that people ate was served without preparatory effort or with minimal cooking. Diets lacked variety, and standards of cleanliness were not what they are

Table 3.5
Annual budgets for urban families of 4, at three levels of living, autumn 1978

	Lower	Intermediate	Higher
Total budget ($)	11,546	18,622	27,420
Total family consumption ($)	9,391	14,000	19,225
Food	3,574	4,609	5,806
Housing	2,233	4,182	6,345
Transportation	856	1,572	2,043
Clothing	847	1,209	1,768
Personal care	301	403	570
Medical care	1,065	1,070	1,116
Other family consumption[a]	515	956	1,578
Other items[b]	502	810	1,365
Taxes and deductions	1,654	3,811	6,830
Social security and disability	719	1,073	1,091
Personal income taxes	935	2,738	5,739

Source: U.S. Bureau of Labor Statistics [1980, p. 44]. Figures are in current dollars.
a. Includes average costs for reading, recreation, tobacco products, alcoholic beverages, costs for education, and miscellaneous expenditures.
b. Includes allowances for gifts and contributions, life insurance and occupational expenses.

today.... There were, of course, a few people who knew what it was to ... eat a meal that consisted of more than one course; but there were very, very few such people, and they were all very rich. The poor, and even the middling comfortable, could not aspire to such creature comforts.... Cleanliness of body and variety of foodstuffs were perquisites only of the very rich in ages past.

Still, when compared with other countries and earlier ages, nineteenth-century Americans were fortunate in the foods they consumed. Cowan lists the foods that ordinary Americans ate before the twentieth century: "Bread, cheese, butter, porridge, eggs, raw fruits and vegetables in season, preserved fruits and vegetables out of season ... all of it washed down by beer, cider, milk, or coffee (rarely water as that was often undrinkable)" (p. 21).

Moreover, by the mid-1870s things were beginning to change, at least for the upper-middle class. The noted Philadelphia Centennial Exposition of 1876 publicized a variety of new food processing techniques: canning, mechanical refrigeration, machines for popping corn, condensing milk, making ice cream, and peeling apples, all of which, according to the Smithsonian Institution [1986], "caused sensations." The commentary goes on to add that "the simple and unvaried American diet based on seasonally and

Table 3.6
Consumption expenditures of city wage- and clerical-worker families of 2 and more persons, 1888–1891 to 1960–1961

	1960–1961	1950	1934–1936	1917–1919	1901	1888–1991
Families covered (number)	19,455[a]	5,994	14,469	12,096	11,156	2,562
Average family size (persons)	3.6	3.3	3.6	4.9	4.0	3.9
Average money income before taxes (current dollars)	6,763	4,299	1,518	1,505	651	573
Money income after personal taxes (in constant 1950 dollars[b])	4,877	4,005	2,659	2,408	1,914	1,793
Average outlays (1950 dollars[b])						
Current outlays for goods and services, total	4,604	4,076	2,564	2,163	1,817	1,671
Food and drink	1,297	1,335	1,030	854	952	797
Clothing	541	473	309	343	—	—
Shelter (current expense)	539	448	356	252	—	—
Fuel, light, refrigeration, and water	207	153	158	126	—	—
Housefurnishings and equipment	297	281	119	109	—	—
Household operation	225	167	80	479[c]	—	—
Automobile purchase and operation	635	457	150		—	—
Other transportation	50	81	57		—	—
Medical care	243	213	88		—	—
Personal care	130	93	55		—	—
Recreation	194	191	67		—	—

Table 3.6 (continued)

	1960–1961	1950	1934–1936	1917–1919	1901	1888–1991
Reading	34	36	27		—	—
Education	42	19	11		—	—
Tobacco	88	80	46		—	—
Miscellaneous goods and services	82	49	11		—	—

Source: U.S. Department of Commerce, Bureau of the Census [1975, p. 322].

a. Estimated number of families, in thousands, represented by sample.

b. The cost of living index developed by Paul Douglas [1926, p. 22] was used to convert the 1888–1891 and 1901 expenditures into 1950 dollars. The Consumer Price Index of the Bureau of Labor Statistics was used for the surveys thereafter.

c. Total average outlays for last 10 categories in 1917–1919.

locally available foods was revolutionized almost overnight as people at the exposition were introduced to unusual foods from far away places that could be preserved and shipped economically, with little risk of spoilage, to local market."

Even before the Exposition most Americans undoubtedly had reason to feel that they lived in a land of unprecedented abundance, since that one-pot stew was quite sure to be there every day.[8] For many centuries in Europe most of the population spent nearly half the food budget on breadstuffs (for example, in 1790 in France, according to Robert Palmer [1964, p. 49], "The price of bread, even in normal times, in the amount needed for a man with a wife and three children, was half as much as the daily wage of common labor"), and for most of them the bread was of what was considered a very inferior variety. Still more commonly, it took the form of gruel (in good years)—what we could think of today as a thin, cooked breakfast cereal. Gruel was consumed in life-sustaining quantities, but there were many years when even gruel was unavailable. Indeed, famine continued to threaten Europe until the beginning of the nineteenth century, and earlier had constituted a normal fact of existence. Fernand Braudel [1979, volume I, pp. 73–75, footnotes omitted, Braudel's emphasis] writes,

> A few overfed rich do not alter the rule.... Cereal yields were poor; two consecutive bad harvests spelt disaster.... Any national calculation shows a sad story. France, by any standards a privileged country, is reckoned to have experienced 10 *general* famines during the tenth century; 26 in the eleventh; 2 in the twelfth; 4 in the fourteenth; 7 in the fifteenth; 13 in the sixteenth; 11 in the seventeenth and 16 in the eighteenth. While one cannot guarantee the accuracy of this eighteenth-century calculation, the only risk it runs is of over-optimism, because it omits the hundreds and hundreds of *local* famines.... They did not always coincide with more widespread disasters.
>
> The same could be said of any country in Europe. In Germany, famine was a persistent visitor to the towns and the flatlands. Even when the easier times came, in the eighteenth and nineteenth centuries, catastrophes could still happen.... famine struck Bavaria, and moved beyond its frontiers in 1816–17: on 5 August 1817, the city of Ulm celebrated with thanksgiving the return to normal with the new harvest....
>
> It would be rash to conclude that the towns, habitual grumblers, were the sole victims of these acts of God. They had warehouses, reserves, corn exchanges, purchases from abroad—in fact, a whole policy directed towards future contingencies. Paradoxically the countryside sometimes experienced far greater suffering. The peasants lived in a state of dependence on merchants, towns and nobles, and had scarcely any reserves of their own. They had no solution in case of famine except to turn to the town where they crowded together, begging in the streets and often dying in public squares, as in Venice and Amiens in the sixteenth century.

The towns soon had to protect themselves against these regular invasions, which were not purely by beggars from the surrounding areas but by positive armies of the poor, sometimes from very far afield. Beggars from distant provinces appeared in the fields and streets of the town(s) ... starving, clothed in rags and covered with fleas and vermin.

In sum, the American's monotonous one-pot stew, while a far cry from today's widespread variety, was an incredible improvement over what had almost always been available to the bulk of the population before.

3.5 Housing

The housing story is similar to that of food. The end of the nineteenth century was a midpoint, far worse than today, but far better than that in earlier Europe. Thus, for example, in the seventeenth century (Braudel [1979, pp. 284–286]),

... in Paris, in the suburbs of Saint-Marcel and even Saint-Antoine, only a few craftsmen-joiners were comfortably off; in Le Mans and Beauvais the weavers lived in penury. But in Pescara on the Adriatic, a small town with about a thousand inhabitants, an inquiry in 1564 revealed that three-quarters of the families in the town, who had come from the nearby mountains or from the Balkans, were virtually homeless, living in makeshift shelters (what we should call shanty-towns). And yet this was in a town which, although small, had its fortress, garrison, fairs, harbour, salt works and was, after all, situated in Italy in the second half of the sixteenth century when it was linked with the Atlantic and the wealth of Spain. In the very rich town of Genoa, the homeless poor sold themselves as galley slaves every winter....

The poor in the towns and countryside of [Europe] lived in a state of almost complete deprivation. Their furniture consisted of next to nothing, at least before the eighteenth century, when a rudimentary luxury began to spread.... Inventories made after death, which are reliable documents, testify almost invariably to the general destitution. Apart from a very small number of well-to-do peasants, the furniture of the day laborer and the small farmer in Burgundy even in the eighteenth century was identical in its poverty.... But before the eighteenth century, the same inventories mention only a few old clothes, a stool, a table, a bench, the planks of a bed, sacks filled with straw. Official reports for Burgundy between the sixteenth and the eighteenth centuries are full of "references to people [sleeping] on straw... with no bed or furniture" who were only separated "from the pigs by a screen."

In the United States in the second half of the nineteenth century things were better, but still quite primitive. The amenities of life in rural Illinois, Michigan and Minnesota in 1850 were described in one Midwesterner's reminiscences (Martin [1942, pp. 136–138]):

In the ruder cabins floors were made of [rough planks], in the better ones of evenly sawed oak boards (which in time shrank and left cracks which let in the cold air).... The clapboard roof of the cabin let snow sift in. The stone fireplace and hearth occupied a large part of one end of the cabin.... The one window contained six panes of glass, six by six inches, and the door was swung on wooden hinges and was fastened with a wooden latch and a leather string. The furniture included a little table with a Bible and an almanac on it, two beds, each with a huge feather tick and sheets and blankets and a prized counterpane and perhaps a trundle bed.... A large chest contained more bedclothing and some of the better wearing apparel. Meals were cooked on the stone hearth and over the fireplace.... The chief cooking utensil was a "spider"—a skillet with legs and with a heavy iron cover which held hot coals; other skillets were also used, placed directly on the fire.... Candles were made at home, in molds, and coarse cloth and carpets were woven at home on a loom. Outhouses were built with several rooms—a smoke-house, a room for rendering lard, rooms for soap-making, washing, and so on. People in that part of the country seldom took baths; when a bath was necessary they used a wooden tub.... In some cabins and houses there was furniture brought from the East; but usually split-bottomed chairs and homemade walnut or maple chests and bedsteads were the best the prairie could afford. In the more remote communities, at least, settlers were dependent for light upon "grease dips"—twisted woolen rags fastened to a button sunk in a saucer of melted grease.

Most of the homes that Frederick Olmstead saw on his travels in rural America in the mid-1800s "... were small houses of logs or loosely boarded frame construction, usually without glass windows. Some were built on stilts, and many of them were built with roofs projecting eight or ten feet beyond the wall; a part of the space thus formed could be enclosed to make a sort of room. The fireplace was usually at one end, of sticks and mud. Other travelers described the farmers' houses in much the same terms—no glass, no lighting except for the fireplace, the doors hung on gudgeons and fastened with wooden latches and strings of green hide, outside chimneys of the crudest construction. Furniture was scanty and homemade" (Martin [1942, p. 131]).

Living conditions in the tenements (that is, the slums) of urban America during the 1800s were truly abysmal. In New York City in the 1860s an average of six persons living in a single 10-by-12 room was common. In 1890 Jacob Riis wrote, of the lower Manhattan tenements, "It is said that nowhere in the world are so many people crowded together on a square mile as here. In [one seven-story tenement building] there were 58 babies and 38 children that were over five years of age.... In Essex Street two small rooms in a six-story tenement were made to hold a 'family' of father and mother, twelve children, and six boarders.... These are samples of the

packing of the population" (Riis [1890, p. 77, 1957 edition]). The worst evils of these overcrowded slums were insufficient light and air, with narrow airshafts that conveyed foul air and disease and served as inflammatory flues when fire broke out; there were no private water closets or washing facilities in these buildings, and cellars and courtyards were foul.

For the better-off in towns and cities (a very small proportion of the population) life was, of course, much easier and the level of housing far superior.[9] By modern standards, however, it was still very crude. For example, even in the cities baths were rare. Obviously, no homes had electricity and few had gas. Fewer still had hot running water, and not even 2% had indoor toilets and cold running water. Boston, with a population of nearly 200,000 in 1860 had only 31,000 sinks, 4,000 baths, and 10,000 water closets (about half of which were extremely primitive affairs). New York City, population 630,000 in 1855, had only 1,400 baths and 10,000 water closets. Albany (population 62,000 in 1860) had in 1859 only 19 private baths and 160 water closets. Outdoor privies were the norm and baths, for the great majority, a luxury. Kerosene for lamps was just catching on, with most lamps lighted by lard oil, whale oil, and some coal oil (while most of the country was still lighted by homemade candles).[10]

Again, for contrast, we note that in 1980 the U.S. Census of Housing found that only 2.2% of American housing units (including private, single-family homes, apartments, trailers, and so on) lacked complete plumbing (defined officially as hot and cold piped water, a flush toilet, and a bathtub or shower, for the exclusive use of that housing unit), and only 4.5% were occupied by more than 1.01 persons per room (U.S. Department of Commerce, Bureau of the Census [1982, pp. 754–755]). Of the new, privately-owned, one-family houses built in 1981, fully 60% had three bedrooms, 46% had two bathrooms, and 65% central air conditioning (p. 748). And 99.9% of all American households owned an electric vacuum cleaner, toaster, radio, iron, coffeemaker, and television (89.8% owned a color television). 99.8% were equipped with electric refrigerators, 92.8% had electric mixers, 77% had electric washing machines, 68% had electric frypans, 63.6% had electric can openers, and 64% had electric blankets! (p. 758; figures are for 1979).

3.6 Clothing and Hygiene

As late as the mid-1800s almost all the clothing that Americans wore was handmade, though only in fairly remote regions and the poorest rural backwaters was cloth still handspun and handwoven. Over the course of

the century factory production of cloth increased rapidly, and (spurred by the Civil War's demand for large quantities of uniforms in standard sizes and patterns) the production of factory-made clothing for men also expanded. Men's suits and overcoats were almost all factory-made by the late century, with women's and children's clothing still almost all handmade (except for women's heavy winter coats).

Of course, the wealthy few were outfitted in professionally hand-tailored clothing, and, indeed, well-to-to American women were sharply criticized abroad for their "extravagance" of dress. But the typical farmer made do with "... a pair of jeans or perhaps denim pantaloons [trousers], probably factory-made because they were so cheap, and a rough work shirt, possibly made by his wife or daughter. With these he probably wore a suit of flannel underwear, cotton or woolen hose, stout brogans, and a ... wool hat." His changes of clothing consisted of "... perhaps two or three shirts and as many pairs of socks, rarely an extra pair of pantaloons. In a day when cleanliness was not taken too seriously he didn't need to worry about what to wear when his shirt or drawers became soiled" (Martin [1942, p. 197]). A "poor white" girl glimpsed by a traveler in the South wore "a soiled, greasy, graying linsey-woolsey gown which was apparently her only garment" (Gilmore [1862, pp. 166, 170]). And the clothing of the children of the slaves in the South "... was like the annals of the poor, short and simple, merely a shirt which reached to the knees. Shoes and hats were useless encumbrances for [black children] in winter as well as in summer. Older Negroes received a new suit of clothes, two pairs of shoes, and a cheap hat each year...." (Martin [1942, pp. 201–202]).

In 1850 commercial laundries hardly existed; 40,000 women gave their occupation as laundresses in the 1860 census (Martin [1942, p. 215]). The latest in washday technology consisted of a revolving barrel turned by a handcrank, but most people still used a washboard to scrub their clothes, and ironed with heavy flatirons heated up on a stove. Most also made their own soap at home, and many recipes were available in the cookbooks of the time. In the mid-1800s any commercial manufacturing of soap was carried out by meatpacking enterprises, since a by-product of that industry was the fat necessary to make soap. In any event, as we have already noted, personal cleanliness was certainly not the obsession that it is among Americans today. The lack of indoor plumbing, unheated rooms in winter, few changes of clothing (and no easy way to clean them), plus the general poverty were all obstacles to the level of personal hygiene to which we are accustomed.[11] Even the relatively well-off readers of *Godey's Lady's Book* were admonished to beware of too many baths; the May 1860 issue

summarized with approval an article from *Hall's Journal of Health*: Bathing in the evening was discouraged, but to bathe in the morning, briefly, and not oftener than once a week, was all right [volume 60, p. 464].

3.7 Nineteenth-Century Consumer Goods

As incomes rose over the course of the century Americans were able to purchase an ever-increasing variety of household conveniences and other consumer goods, including such items as the hand-driven washing machines just mentioned, water taps for indoor cisterns, egg beaters, pulley-driven butter churns, apple parers, double boilers, and so on. By the late 1800s mail-order department stores had begun to thrive; the Sears Roebuck and Montgomery Ward catalogues made it possible for Americans to order just about any of these household items.

Above all, these catalogues illustrate how much better off at least middle-class Americans were toward the end of the nineteenth century than anything that had been known in Europe in earlier centuries. They also offer a fascinating glimpse into the way of life then, showing what (at least a large portion of) the populace wore, how it traveled, what it read, how it spent leisure time and what amenities were available. For instance, in the 1895 Montgomery Ward catalogue only 4 pages are devoted to ready-made suits for ladies and children while 31 pages are packed with all manner of fabrics to be sewn by the housewife into the family's clothing, bed linens, and other household items. The 39-page book department advertises 3,000 titles, ranging from best sellers of the time to "How to Make and Use a Telephone" and "The Physical Life of Women." The optical goods department features a test-yourself chart to be held a certain distance from the eyes to determine which eyeglasses to order. There are "scientific" instruments such as the "Portable Electro-Medical Battery" to cure "paralysis, rheumatism, neuralgia, and all nervous diseases." Twenty-nine pages are devoted to saddlery and harnesses, and the largest department of the catalogue is Guns and Sporting Goods, with 30 of the 59 pages devoted to firearms and ammunition. Labor-saving devices for the household include hand-powered clothes wringers, self-adjusting carpet sweepers, ice boxes for refrigeration, and many hand- and animal-powered farm implements, including a sheep or dog-powered treadmill that powers a milk separator.

In tables 3.7A and 3.7B we present an unscientific, but illuminating, sampling of goods listed in the Sears Roebuck catalogues of 1908 and 1985. This small sample is sufficient to portray dramatically the differences

Table 3.7A
Items offered in the 1908 Sears Roebuck catalogue: a sample

Traveling trunks	Boil remedy
Hatmaking goods, trims, etc.	Blackberry cordial[b]
Games (checkers, ouija boards, dominoes, chess sets)	Quinine pills
Jokester articles	Methylene blue compound pills for gonorrhea
Dolls and toys	"Quick Death" bug killer
Chamber pots	Bed bug exterminator
Cuspidors	Hot water bottle
Butter ladles	Bust forms
Men's dogskin coats	Ladies', men's and children's shoes
Buffalo fur coats	Rubber footwear
Made-to-order men's suits	Leggings
Imported palm plants	Cobbler outfits
"Teddy" bears	Yardgoods
Wood, coal or corncob-burning stoves	Long underwear
Woodburning steel ranges	Men's furnishings
Pot-bellied stoves	Hand-cranked coffee mills
Laundry stoves	Galvanized, odorless commodes and slop buckets
Gas ranges	Clothes pins and lines
Box and folding cameras	Irons
Photograph developing outfits	Egg beaters
Draftsmen sets	Tinware
Kerosene-powered "Magic Lantern" outfits for slideshows	Brass beds
Lawn tennis goods	Oil-base house paint
Boxing equipment	Velocipedes (three-wheeled)
Carpet sweepers	Surveyor's instruments
Firearms	Hearing horns
Animal traps	Musical instruments
Hunting knives	Battery-operated telephones
Cowboy's waterproof wool-lined bed sheet[a]	Telegraph outfits
Gospel tents	Gas light fixtures
Circus tents	Kerosene Lamps
White duck emigrant wagon covers	Clocks
Razors	Fountain pens and ink pencils
Castor oil	Pocket watches
Carbolic arnica salve	Home tooth forceps for extracting teeth
Cod liver oil	Toilet preparations

Table 3.7A (continued)

Hair tonics	Moliograph motion picture machines (kerosene-operated)
Rouge	Windmills and towers
Toothbrushes and sundries	Clothes wringers
Hand-cranked cream separators	Bathroom equipment (toilets, sinks, tubs)
Treadle-operated sewing machines	Carpets
Books (Bibles, cookbooks, family doctor manuals, how-to-do books such as blacksmithing and beekeeping)	Rubber buggy tires
Six-month correspondence course in bookkeeping	Paddles
Stationery	Hand-cranked sheep-shearing machines
Buggies, surreys, phaetons, cabriolets	Lap robes
Commercial and farm wagons	Railroad attachments for bicycles
Horse harnesses	Stereoscopic views
Lariats and other ranch gear	Talking machines (gramaphones and graphaphones with wax cylinder records)
Buggy whips	Furniture (parlor suites, washstands, wardrobes, chifforobes, Morris chairs, china cabinets, sideboards)
Tombstones	Stock food
Bicycles	Beehives and beekeeper supplies
Spectacles and eyeglasses[c]	Poultry brooders
Electric medical battery	Hand-operated washing machines
Groceries (in separate catalogue)	Home-building plans
Ice chests	Cavalry riding pants
Tools	Wigs
Rotary lawn mowers	Wallpaper
Horse-drawn plows	Cowboy saddles

a. "... for herders, prospectors, explorers who are compelled to sleep in a tent or on the ground."
b. "... formerly known as blackberry brandy ... used and prescribed by many physicians as one of the simplest and most effective remedies for all derangements of the stomach and bowels ... tones up and invigorates the system."
c. With "test-yourself" chart included in catalogue.

Table 3.7B
Items offered in the 1985 Sears Roebuck catalogue: a sample

Electronic, stereo televisions	Electric air conditioners
Electronic sewing machines	Portable radios
Fluorescent light fixtures	Plastic indoor/outdoor carpeting
Video cassette recorders	Latex house paint
Electronic speech synthesis telephones	Farm and Ranch catalogue, which includes
Exercise equipment	Beekeeping outfits
Electric weed trimmers	Bees
Digital automobile engine analyzers	Poultry and supplies
Electronic blood pressure monitors	Electric grain mills
Power-propelled lawn mowers	Electric milk pasteurizers
Electric water pumps	Electric winches
Stainless steel sinks	Electric sheep-shearers
Electronic clothes washers and dryers	25-mile solar-powered electric fencing
Citizen band radios	Gas or electric chain saws
Personal computers and software	Gas-powered tractor mowers
Gas furnaces	Plus 19 other special catalogues, including
Audio cassette players	Big and tall men's clothing
Electronic bathroom scales	Women's and half-size clothing
Backyard storage buildings	Uniforms
Electric irons, skillets, coffeemakers, woks, toasters, waffle irons, vacuum cleaners, etc.	Work clothes
Microwave ovens	Home health care products
Frostless refrigerator/freezers with automatic ice/water dispensers	Mother-to-be and baby products
Fitted, no-iron sheets	Carpeting
Electric razors	Power and hand tools
Men's, women's, children's clothing (about half the catalogue)	Office equipment and supplies
Plastic house shutters	Heating and cooling supplies
Convection electric heaters	Recreational boating equipment
Electronic dishwashers	Cameras and photo/video supplies
Video movie cameras	Stitch, latch and other crafts
Electronic typewriters	Recreational vehicle and camping equipment
Automatic-dial telephones	Toys
	Motorcycle accessories

in the kinds of consumer goods that have become widely available since the turn of the century: for example, a "Speech Synthesis" electronic telephone in 1985 versus one year's supply of stationery in 1905; a "Shapemaster 1000" exercise machine in 1985 versus a state-of-the-art, hand-powered sheep-shearing machine in 1905; a digital automobile engine analyzer versus a side-sprung runabout buggy. And, in table 3.8 we reproduce Stanley Lebergott's [1984] wrap-up of some of the dramatic changes in American consumption and living conditions since 1900—among them the sharp drop in consumption of inferior foods, the decrease in the percent of families taking in boarders and lodgers, and the number of families today with running water, flush toilets, and refrigerators (virtually 100%).

3.8 Working Conditions and Leisure Time

In 1850 the typical workday in factories, shipyards, and shops was a little over 11 hours (6 days a week), and even by 1900 workweeks continued to average about 57 hours.[12] Farm workers, who constituted half of the labor force, put in the traditional "first light to dark" workday, and employees worked even longer hours in some occupations (for instance, dry goods and grocery clerks in New York and Chicago in the midcentury worked 14 hours a day, 6 days a week) (Martin [1942, pp. 344–345]). Maddison [1982] reports that average annual hours worked per person in 1870 amounted to 2,964 compared to 1,607 in 1979 (p. 211). Clearly, the modern preoccupation with recreation and leisure activities such as sports, cultural events, vacationing and vacation travel, television viewing, and the like is a vast change from life in the nineteenth century. Vacations were certainly unknown except for the very rich; for nearly all of the population there was little time (or money) for recreation;[13] almost all time and energy were taken up with long hours of hard work. What little leisure time did exist was often devoted to religious activities or the celebration of rare general holidays (such as the Fourth of July).[14]

It was also virtually unknown in the nineteenth century for members of the laboring population to enjoy a period of retirement in their later years; people literally worked themselves into the grave. It was common for children to work. As late as 1890, 150,000 children were employed in factories. Today, adult wages have risen enough that children no longer must contribute income to ensure most families' economic survival. Mandatory school laws and child labor laws have also contributed to this change (Wells [1982]).

Working conditions, too, were far from idyllic, as is illustrated by the

Table 3.8
Consumption changes, 1900–1979

	1900	1979
Food: percent families consuming		
Lard	95	9
Salt pork	83	4
Molasses	69	2
Corn meal	90	22
Food: per capita consumption (pounds)		
"Inferior" foods		
Flour and meal	300	140
Potatoes	212	83
Milk	274	187
Preferred foods		
Sugar	86	132
Meat	148	222
Food preparation		
Flour: percent baked at home	92	22
Expenditures on raw vegetables as percent of all food	96	30
Expenditures on food at home as percent of all food	99	82
Housing: value of average dwelling (1958 dollars)	$4,727	$7,000
Housing: percent of families		
With boarders and lodgers	25	2
Over 1 person per room	49	8
Over $3\frac{1}{2}$ persons per sleeping room	23	7
Without		
Running water	76	2
Flush toilets	87	4
Central heat	99+	22
Gas or electric light	88	0
Heating with		
Wood	50	1
Coal	50	3
Owing		
Refrigerator	18	99
Washing machine	5[a]	70
Vacuum cleaner	0	92
Tobacco: cigarettes produced (millions)	5	673

Table 3.8 (continued)

	1900	1979
Transport: percent of urban families		
Owning a horse	20	
Owing a car		80
Recreation: percent of families with		
Radio	0	96
TV	0	99
Telephone	5	91
Health: death rate (per 1,000) from		
Pneumonia	153	33
Diarrhea	116	0
Typhoid	31	0
Physicians per 1,000 population	1.72	1.86
Service expenditures per capita (1972 dollars) (rent, health, transport, recreation, personal care, education, etc.)	37	340

Source: Lebergott [1984, pp. 492–493].
a. Rough approximation.

following recollections of Pauline Newman, who in 1911 was a child laborer in a garment factory (Morrison and Zabusky [1980, pp. 10–13]):

We started work at seven-thirty in the morning, and during the busy season we worked until nine in the evening. They didn't pay you any overtime and they didn't given you anything for supper money. Sometimes they'd give you a little apple pie if you had to work very late. That was all. Very generous....

We had a corner on the floor that resembled a kindergarten—we were given little scissors to cut the threads off. It wasn't heavy work, but it was monotonous.

Well, of course, there were laws on the books, but no one bothered to enforce them. The employers were always tipped off if there was going to be an inspection. "Quick," they'd say, "into the boxes!" And we children would climb into the big boxes the finished shirts were stored in. Then some shirts were piled on top of us, and when the inspector came—no children. The factory always got an okay from the inspector, and I suppose someone at City Hall got a little something, too.

The employers didn't recognize anyone working for them as a human being. You were not allowed to sing.... We weren't allowed to talk to each other.... If you went to the toilet and you were there longer than the floor lady thought you should be, you would be laid off for half a day and sent home. And, of course, that meant no pay. You were not allowed to have your lunch on the fire escape in the summertime. The door was locked to keep us in....

The employers had a sign in the elevator that said: "If you don't come in on Sunday, don't come in on Monday." You were expected to work every day if they needed you and the pay was the same whether you worked extra or not.

Conditions were dreadful in those days. We didn't have anything.... There was no welfare, no pension, no unemployment insurance. There was nothing.... There was so much feeling against unions then. The judges, when one of our girls came before him, said to her: "You're not striking against your employer, you know, young lady. You're striking against God," and sentenced her to two weeks.

3.9 Education

By one estimate, in 1860 each person in the United States received during his or her lifetime, on average, only 434 days of schooling (or 21 school months plus 14 days), a decided improvement over the average of 82 days in 1800, but still little more than the most rudimentary formal education (Martin [1942, p. 297]). In 1870 20% of the population was illiterate, compared to about 4% in 1930 and only 1% in 1969. Only 2% of the 17-year-olds in 1870 graduated from high school; 100 years later close to 76% did (U.S. Department of Commerce, Bureau of the Census [1975, p. 379]). Urban schools, though free, were not well attended (in 1858 the number of children registered for school in New York City was 139,441 but the average attendance was only 51,430). Rural schools were often hardly better than none. Teachers were usually poorly trained and paid, and the average annual school expenditure per pupil was only $4.50 in 1858 (Martin [1942, p. 299]).

3.10 Travel

By the mid-1800s the isolation of the population was starting to give way, as the railways spread and roads were improved (though, even by 1900, only 20% of all urban families owned a horse). But travel was still very difficult and time-consuming. Railroads served only large cities and some towns that happened to be on the trunk routes. Stagecoach travel was still very important; in many of the frontier states it was the only means of travel, and a very arduous means of transport it was, not to be undertaken casually. Most roads were very bad, obviously unpaved, often unpassable, with almost no bridges outside of the cities.

Furnas [1969, pp. 278–279] writes of one traveler in the 1830s, who commented,

"As no attention has been paid to forming or draining roadbeds, ... it is only for a few months during summer that they ... are tolerable." He was aghast at the corduroy roads made in backward areas by juxtaposing 12-foot logs across the road, which kept wheels from sinking into soft ground but also forced them to progress "by ... leaps and starts, particularly trying to those accustomed to the comforts of European travelling." Less temperate comments were frequent from

testier travelers. The Reverend Mr. Read of the Congregational Union of Great Britain, touring Ohio in 1834 on the Lord's business, thought the road between Sandusky and Columbus more like a stony ditch than a road; a stagecoach with him as sole passenger took seven hours to go 23 miles. He was even worse off when, below Cincinnati, he was one of three passengers in a fast mail coach the horses of which trotted, keeping him so "jarred and jolted, as to threaten serious mischief ... my hat was many times thrown from my head, and all my bruises bruised over again. It was really an amusement to see us laboring to keep our places." It was, after all, an American stage driver in Illinois who said that the mud was often so deep on his run that though he had driven a team of mules for months, he did not yet know what color they were—he never saw anything of them but their ears.

And, after completing an arduous trip by camel through the Middle Eastern desert, George Perkins March wrote, "Any forty days of *stage* travelling in the United States would involve more of fatigue, danger and discomfort of all sorts" (Furnas [1969, p. 279]). Today, one can get some feel for this kind of travel in places like the jeep trails of the Rocky Mountains, where just an hour in a modern, well-sprung, four-wheel-drive vehicle can leave the passenger tired, sore, and nauseated.

An average of 5 miles per hour between Cumberland, Maryland, and Wheeling, West Virginia, was typical of the rate of speed possible. Boston to New York in the 1800s was about 6 miles per hour. Even city streets were poorly, if at all, paved, obstructed and filthy—overrun with animal scavengers. In cities as large as New York goats, geese, chickens, sheep, and pigs wandered the streets.

3.11 Life Expectancy, Physical Stature, and the Public Health

American children born in the 1980s can expect to live an average of almost 75 years. By 1984 infant mortality had fallen to only 10.6 deaths per 1,000 births.[15] In stark contrast, a century ago infant mortality hovered around 170 deaths per 1,000 births;[16] and a female born in 1855 could expect to live an average of a little less than 41 years, while a male could expect an average life span of less than 39 years (Martin [1942, p. 220]). The increase in life expectancy is truly one of the extraordinary accomplishments of modern society, and one in which productivity improvements and the resulting rise in living standards have played an important role. Recent studies have suggested that, along with improvements in medical technology and the expansion of hospital services, nutritional status has played a major part in the trends in average life span (accounting for perhaps as much as 40% of the drop in mortality rate). In a study of the trends in both

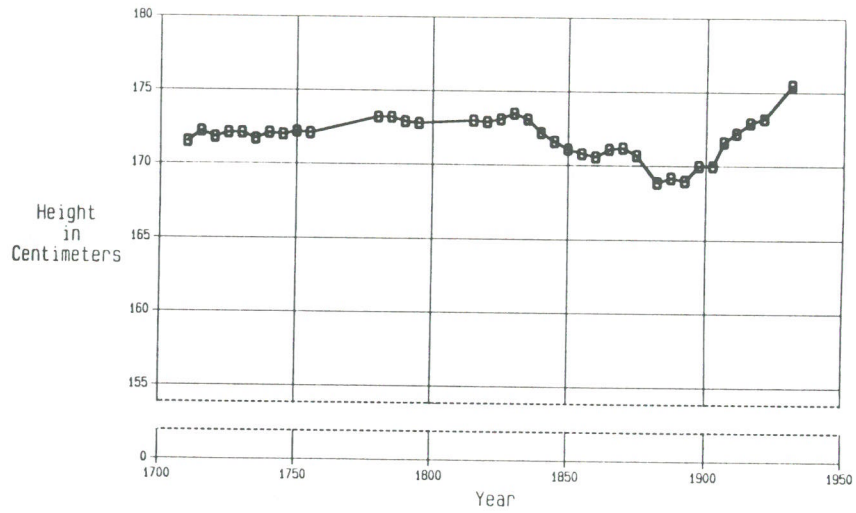

Figure 3.1A
Trend in mean final height of native-born American white males, 1710–1931. Source: Fogel [1986b, p. 511].

life expectancy and physical stature[17] between 1720 and 1980, Fogel et al. [1986b] found that the middle of the nineteenth century probably represented a low point for both of these measures of living conditions. According to their preliminary analysis of recently tabulated genealogical records, the trends in American life expectancy and height have not risen in a continuous, smooth curve toward modern levels. In fact, modern levels of life expectancy and height were reached in the mid- to late 1700s, during a time when America was sparsely settled, population density was too low to support major epidemics, and rural colonialists were relatively well-fed (particularly compared to their European counterparts). Then, starting in the 1790s average life span began to decline and continued to decline for more than half a century. Average heights started to fall at the end of the 1700s and then declined sharply after about 1830; heights did not begin to rise again until the end of the nineteenth century. Figures 3.1A and 3.1B portray the rather similar histories of height and life expectancy.[18]

The reasons for the declines of the 1800s are the subject of continuing debate, but they do coincide with a number of changes in American life that are plausible explanations. Certainly living conditions for much of the laboring population deteriorated in the nineteenth century; a huge influx of poor immigrants, most of whom settled in the cities, together with the general move of the population from the relatively wholesome and healthy

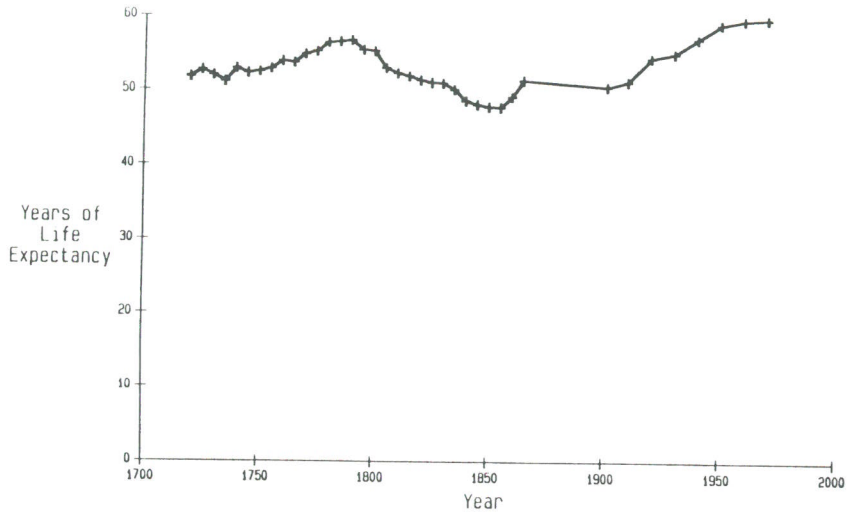

Figure 3.1B
Trend in life expectancy of native-born Americans at age 10, 1710–1970. Source: Fogel [1986b, p. 511].

countryside to urban areas (as factories sprang up and offered employment) produced extreme overcrowding. Housing conditions were wretched, and the crowded tenements with their primitive sanitary provisions were perfect breeding grounds for disease. Increasing urbanization also probably contributed to the pollution and increase in disease in adjacent rural areas, for example, by polluting rivers and streams. Despite the evidence that real wages and per-capita food intake were generally rising throughout the nineteenth century, it is also clear that these improvements were not only sporadic but very unevenly divided among the population.

Thus, public health in the 1800s (particularly in the cities, but also in towns and rural areas) was at best precarious. Great epidemics of diseases, now essentially unheard of, periodically ravaged the population. The most dreaded diseases were cholera and yellow fever. Particularly severe country-wide epidemics occurred in 1849 and 1854. In New Orleans alone there were 30,000 cases of yellow fever in 1853, and as late as 1879 yellow fever killed 4,000 in Memphis in a single epidemic. In the early 1860s in New York City there were as many as 12,000 cases of typhoid fever a year. Smallpox was still widely prevalent, particularly in the seaports, and in the South and West was so common that it was taken for granted. Diphtheria was not believed to be communicable so no precautions against its spread were taken. Scarlet fever, dysentery, and tuberculosis also levied a heavy toll.[19]

It was only in the late 1800s that scientists started to identify disease microbes and discover causes and cures. Up until then, medical practice was very crude; doctors could do almost nothing to cure disease, and their main functions, besides setting broken bones, sewing up wounds, and other purely mechanical tasks, were to comfort and console.[20] Medicine had made only a few advances in diagnosis, treatment and operative techniques (for example, the use of general anesthesia in 1844). Even these few advances had little effect in improving the general medical practice of the country, which was characterized by poorly trained and scientifically ignorant physicians[21] and a scattered population, the great mass of which tended to rely on family remedies and fads of all sorts: cure-all patent medicines (which were mostly alcohol), mechanical, magnetic, and electrical devices supposed to be useful in treating diseases, phrenology, spiritualism, muscle manipulation, and so on. Scott and Wishy [1982] write that often the threats of disease were "... increased by supposed preventatives or palliatives like closed windows or increased warmth to treat fevers. Too many medicines were eventually found to be dangerous drugs or poisons" [p. 393]. As late as the 1830s Samuel Clemens would describe the ministrations of local Missouri doctors: "Castor oil ... half a dipperful ... the next standby was calomel.... Then they bled the patient and put mustard plasters on him...." (Furnas [1969, p. 333]). In 1860 Oliver Wendell Holmes declared, "If the whole materia medica, *as now used*, could be sunk to the bottom of the sea, it would be all the better for mankind,—and all the worse for the fishes" (Martin [1942, p. 231, Holmes's emphasis]).

There were very few hospitals. In 1873 there were only 149 hospitals and allied institutions in the country (and one-third of them were for the mentally ill). Most were charitable institutions for the poor, and operated under very crude, unsanitary conditions with frequent epidemics among the unsegregated patients. Anyone who could afford it was treated at home or in a doctor's office.

There was little knowledge in the 1800s about the means for prevention of the spread of epidemic disease. Absence of municipal cleanliness was a major public health problem, and facilities for disposal of human wastes, animal manure, garbage, and other household refuse were grossly inadequate. Garbage was thrown into the streets and alleys, and pigs and dogs, in cities as large as New York, served as scavengers (in some cities the scavengers were geese, and in many Southern cities buzzards cleaned up the garbage). Slaughterhouses, livery stables, rendering plants, junk and manure heaps were unregulated; animals had the freedom of the streets in all but a few cities. The absence of regulation of food markets also made for extremely unsanitary conditions.

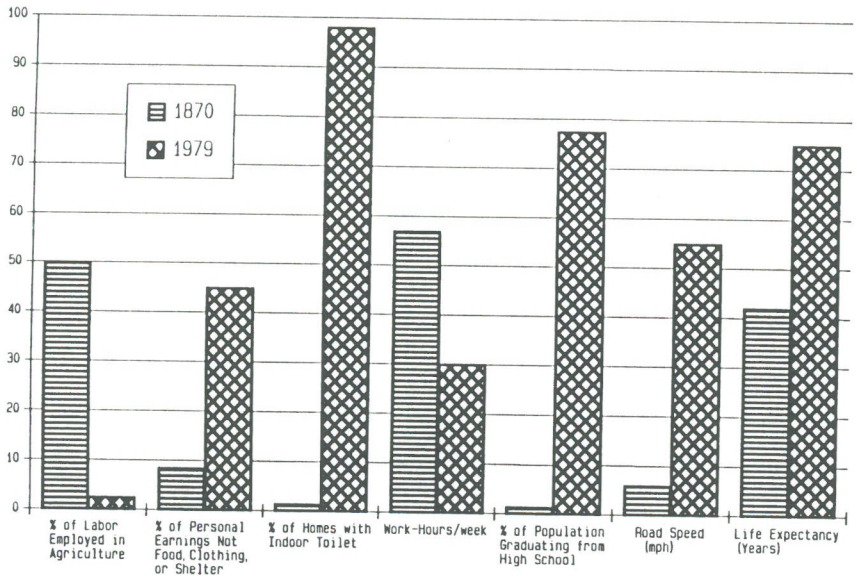

Figure 3.2
Some life-style changes, 1870 and 1979. Source: Compiled by authors.

Hardly an American city had an adequate sewage system. Even Boston, New York, and Philadelphia had only partial systems whose conditions and operations were so poor that the stench from the inlets and outlets was almost intolerable. Streets were filthy more often than not, with street-cleaning inadequate or completely absent. Everywhere, ordinary sanitary precautions were neglected, and mosquitoes, flies, and other germ-harboring pests were regarded with equanimity.

3.12 Conclusions

The preceding account of the American standard of living in the nineteenth century reads remarkably like a description of a contemporary, less developed country, and recalls the comparison made early in the chapter: American per-capita GNP in the mid-nineteenth century just about matched that in present-day countries, the majority of whose citizens struggle through a rude, hand-to-mouth existence in many ways medieval in its primitiveness. We have touched on a number of the components of the standard of living in this chapter, and have tried to show how economic growth has profoundly altered American lives. Figure 3.2 dramatically portrays a number of those changes, including share of the labor force in agriculture, percentage of personal income devoted to the basic requirements of food, clothing and shelter, and work-hours per week. Rising incomes and the fruits of the technological revolution have filled our lives with goods and services unavailable, and even unimaginable, 100 years ago and, perhaps most important, the revolution has produced its most dramatic changes in the lives of the millions of ordinary working people. Today, virtually no American family is without electricity, or hot and cold running water, or an indoor toilet, or household amenities such as stoves, refrigerators, and vacuum cleaners. Televisions, automobiles, educated and healthy children, reasonably nutritious diets, freedom from the dreaded diseases of the past, the luxury of vacations and retirement years, and long life expectancy have all become part of the American standard of living. Indeed, the continual rise of real incomes and the constant parade of new consumer products have become commonplace phenomena. Among the items that have reached mass markets during the lifetimes of many of us are video recorders, personal computers, microwave ovens, and jet airplanes. Yet few people regard any of these with the wonderment that early in this century greeted the advent of electric lighting, the radio, and the automobile. Change has become so commonplace that we all have become blasé about it. That is a striking departure from virtually anything that humanity has experienced before.

Postscript: Which Income Groups Gained Most from the Revolution in Living Standards?

Though benefits as spectacular as those that have been described in this chapter can hardly have left any income group in the American population untouched, they probably have not been distributed perfectly evenly. The evidence on their distribution is far from clear, and we can offer only a few suggestive observations on the subject.

Some observers have suggested that the very wealthy were those who gained the least from the increase in living standards. Rosenberg and Birdzell [1986] write, "... Western economic growth ... benefited the life-style of the very rich much less than it benefited the life-style of the less well-off.... The very rich were as well-housed, clothed, and adorned in 1885 as in 1985.... In fact, the innovations of positive value to the rich are relatively few: advances in medical care, air conditioning, and improvements in transportation and preservation of food" [p. 27]. A primary consequence of mass production was to reduce the real cost of items previously beyond the means of any but the most affluent. As we have seen, variety in foods

was once available only to the very rich. And only the very rich once possessed more than one or two changes of clothing, lived in comfortable homes, or traveled for pleasure. Today all these things are widely enjoyed by members of even the lower middle classes. The homes of the wealthy today are not notably more elegant than those of 1870; nor is their clothing more luxurious. This is in sharp contrast to what has happened to the median American income group whose living conditions have undergone an improvement of revolutionary proportions. In terms of assistance in household tasks, the middle and lower classes now have at their disposal a great variety of equipment—washing machines, vacuum cleaners, refrigerators, and so on. The upper income groups, in contrast, may even be held to have lost out somewhat through the reduction in number of household servants, even in the wealthiest of homes.

There is probably much truth to this evaluation, but it surely requires some additions and amendments. The first relates to the very poor, the miserable stratum of society that inhabits the most dreadful slums or is altogether homeless. Descriptions of nineteenth-century tenements are indisputably horrifying, but who is to say whether they are matched by reports of vermin-infested slums of today, in which cracked walls cannot exclude the cold and legal heating requirements are regularly flouted. The inhabitants of those slums, it is true, are offered various forms of public assistance today; their children are entitled to schooling and medical treatment that would have been beyond anything their predecessors could have aspired to a century earlier. Yet one can hardly muster confidence in an assertion that these most underprivileged members of our society are really better off today. The very increase in the relative standards attained by other income groups must surely increase the frustration and despair of those to whom the American dream is hardly even worth dreaming about.

The story, however, is even more complex than this reservation suggests. While it may be true that the very poorest, like the most wealthy, have gained *relatively* less over the course of a century, comparison with their status in the sixteenth and seventeenth centuries suggests that both these groups have gained a great deal indeed, at least over this *longer* period. To recognize what the poor have gained we need merely recall section 3.4 on food consumption. Even welfare recipients today are hardly expected to subsist on the one bowl of gruel, which, with rare exceptions (usually on holidays), was the universal food of much of the population in earlier centuries. Far more than that, the perpetual threat of famine, which was likely to recur and cause widespread death by starvation, has disappeared in this country and other industrialized lands. The end of that

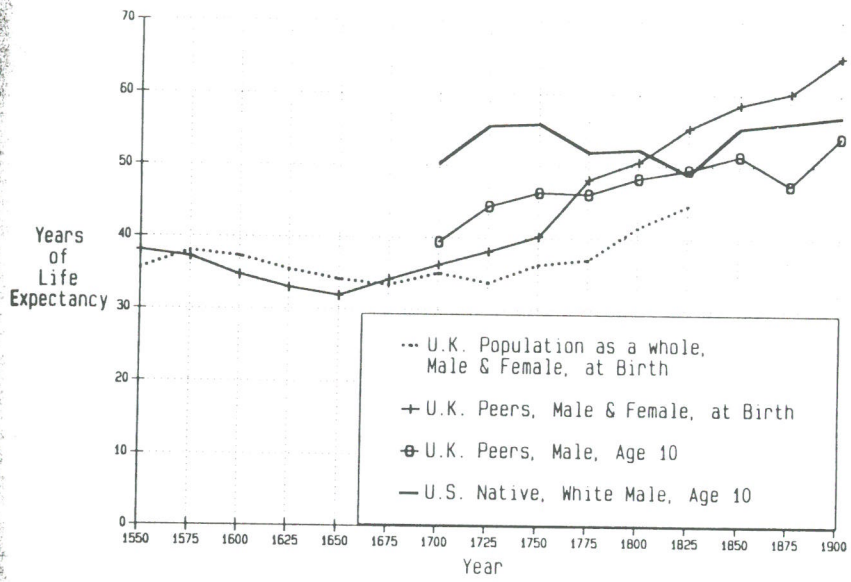

Figure 3.3
Life expectancy for four British and American groups (at birth or age 10), 1550–1900.
Source: Fogel [1986b, pp. 445–467].

specter is economic progress indeed, even for the poorest members of the community.

Not only the poor but the very rich have also gained much in terms of health and personal comfort in the course of two or three centuries. The evidence of genealogical records is remarkable in this regard. In the first quarter of the twentieth century the average expected longevity at birth of a member of the British peerage (nobility), male and female, had reached 65 years. But in the two centuries following 1550 (in the middle of the reign of the Tudors) that figure was a mere 35 years. More remarkable, for that period the average longevity figure for peers was almost identical with that of the general male and female population of England and Wales, despite the miserable living conditions of the bulk of the nation. It is also noteworthy that as late as the first quarter of the eighteenth century, when the life expectancy of a British male peer at age 10 was a bit more than 39 years, that of an American male of age 10 was a bit more than 50 years (the full time series are depicted in figure 3.3). Clearly, the health of a British nobleman several centuries ago still had a long way to go.[22]

In terms of comfort the improvements in the circumstances of the rich over a longer time period is equally dramatic. We illustrate the change in

terms of one development: home heating technology. Before the early decades of the eighteenth century the role of the draft in fireplace construction had not been discovered. As a result, the huge fireplaces in the homes of the nobles, though beautiful, were extremely ineffective as heating devices, roasting nearby persons on one side while they froze on the other side. As a result, as Braudel [1979] reports, "Cold weather, at that period, could be a public disaster, freezing rivers, halting mills (with little or no flour having been stored because preservation methods were largely unknown), bringing packs of dangerous wolves out into the countryside, multiplying epidemics" [p. 299]. This affected the nobility as well. On this subject, historians like to cite the Princess Palatine (the German sister-in-law of Louis XIV, living in Paris and Versailles), who reported in one cold January that "... all entertainments have ceased as well as lawsuits." More remarkable is her report in February of 1695 that "[in the Hall of Mirrors at Versailles] At the King's table the wine and water froze in the glasses." One may note that matters began to improve for the wealthy in France during the period of regency (1717–1723) of the Princess Palatine's son, Philip of Orleans (Braudel [1979, p. 299]).

Figure 3.3 suggests that for the British aristocracy improvements in hea!th and longevity began perhaps a few decades earlier and that since then the longevity of peers increased almost uninterruptedly at least until the beginning of the twentieth century. Improvement for the bulk of the population of England and Wales waited about another century for its inauguration; and the rate of ascent of their life span seems not to have attained that of the peers during the period for which data are reported by Fogel [1986a, b]. At least in that sense, then, the Industrial Revolution may have benefited "the upper crust" even more than it did the population generally.

Notes

1. See table 2.1.

2. Cowan [1983, p. 194, citing Patterson [1981]:

> The minimum subsistence budget that was used to determine welfare payments in New York City in 1960 specified a set of material conditions for family life that would have been regarded as fairly luxurious in 1910 [much less 1860]. . . . A four-person family was permitted to rent a five-room flat, so that each member of the family who wanted to could "be alone in a room"—a luxury inconceivable to most poor families earlier in the century. The flat was to be outfitted with a complete bathroom (hot and cold running water, toilet, bath or shower, and a sink), a complete kitchen (sink with a drain, hot and cold water, refrigerator, and a gas or electric range), and central heat. Plain but adequate furnishings were allowed (each person was to have a bed and a complete set of eating utensils) as well as annual replacement clothing for the children (shoes that fit, dresses that were new and not made over from hand-me-downs). The diet for such a family was not to contain luxurious foods such as steak, but did allow meat, milk, fresh fruits and vegetables to be served at least once a day. The family was also allowed an iron and a vacuum cleaner (although not a washing machine or a dryer) and linoleum (although not carpeting) to cover all the floors. That set of material conditions . . . regarded as deprivation in terms of the general standard applying throughout the country in 1960 . . . was luxurious (compared to how people lived in the nineteenth century, and even early in the twentieth).

3. Here we offer two words of caution: First, in this chapter, we present evidence on the vast improvements in material welfare since the nineteenth century. We do not make any judgments, however, about whether Americans are better off than their nineteenth-century counterparts in other, less tangible ways. Who can say, for example, whether the mass exodus from farms to cities benefited society's psychic state? And what price have Americans had to pay for their increased prosperity—emotionally, culturally, and environmentally? Second, it is clear that the improvements in material welfare have not accrued evenly among all income groups. Wealthy nineteenth-century Americans already lived a life of luxury, and while they certainly participated in many of the gains of the twentieth century (including improved life expectancy and better medical care, plus all the technological wonders such as air conditioning and jet airplane travel), they also lost some of the amenities that they enjoyed (for example, large staffs of personal servants; indeed, even middle-class nineteenth-century families routinely employed a number of servants, such as laundresses, scrubwomen, gardeners, and seamstresses). At the other extreme, the very poorest in America today have also benefited from the increase in prosperity (for example, in medical care and some other basic amenities like electricity and plumbing), but certainly have not participated fully in the huge improvements in material conditions that have accrued to the millions of middle- and lower-middle-class Americans. We explore this issue further in the postscript to this chapter.

4. A mechanic was a semiskilled day laborer. Nettie's father made the family's living by subsistence farming, living off the land, trading his services for other goods like milk and the use of a neighbor's horse to plow his field, and selling his services or handmade tools for money.

5. In 1860 the *New York Tribune* wrote that it was rather above the mark to place annual earnings of skilled workers in New York City (such as journeymen mechanics and manufactures) at $400 (or about $3,500 1980 dollars) (Martin [1942, p. 410]).

6. Income figures for 1860 are from Martin [1942, p. 393]. To convert nineteenth-century incomes into 1980 dollars, we spliced together two GNP implicit price deflator series: one series (U.S. Department of Commerce, Bureau of the Census [1975, p. 224]) runs from 1869 to 1970 (1958 = 100); the second series (*Economic Report of the President* [1984, p. 224]) runs from 1929 to 1983 (1972 = 100). To make the two series comparable, we converted the second series to a 1958 baseline (by dividing each number by the 1958 number). Then, in order to express incomes

in 1980 dollars, we divided the numbers in both series by the 1980 deflator figure. The official U.S. poverty level for 1980 is taken from U.S. Department of Commerce, Bureau of the Census [1982, p. 417].

7. In 1899 per capita consumption of lard (animal fat) was 12.8 pounds, compared to 4.6 pounds per person in 1970 (U.S. Department of Commerce, Bureau of the Census [1975, pp. 329–330]).

8. American abundance relative to European standards was not new in the second half of the nineteenth century. As we shall see later in the chapter, there is evidence suggesting that Americans were also better fed and healthier in earlier periods.

9. The homes of well-to-do Americans were described by one British traveler as "tasteful and elegant" (Reid [1861]), and included such amenities as weighted sash windows, rainwater cisterns, lever-operated water closets, copper-lined bathtubs and showers, hot and cold running water, furnace heating, gas lighting, and elaborate Victorian furniture. Many of the residences of St. Louis were "costly and beautiful" (Dana [1857]), and in Westchester, New York, "Miles and miles of unmitigated prosperity weary the eye. Lawns and park-gates, groves and verandahs, ornamental woods and neat walls, trim hedges and well-placed shrubberies, fine houses and large stables, neat gravel-walks, and nobody on them" were to be seen (Willis [1853]).

10. The statistics in the paragraph are taken from Martin [1942].

11. In an entertaining review of Corbin [1986], Gewen writes [1986, p. 12],

> It is no exaggeration to say the past stank. The smells of refuse, stagnant water, cesspools, offal, even corpses, were facts of daily life. Breaking wind in public was an approved practice. In the cities, people emptied their chamber pots in the streets, in the country they lived alongside their animals. Infants padded about unswathed, free to urinate and defecate at will.
>
> Personal cleanliness was almost nonexistent—bathing and the brushing of teeth were rare, shampooing unknown. As recently as the end of the nineteenth century, it was said that most Frenchwomen died without ever having taken a bath. Underwear was infrequently changed. In the Middle Ages, both castle and hovel were so immersed in muck that, as Emmanuel Le Roy Ladurie points out, "villagers carried around with them a whole fauna of fleas and lice: people not only scratched themselves, but friends and relations from all levels in the social scale deloused one another."
>
> Filth was not merely accepted, it was esteemed. No one, for example, had to explain to farmers the worth of human excrement as fertilizer, while sewage and waste products were widely believed to *prevent* disease. Grandmothers passed on to mothers the folk wisdom that "the dirtier children are, the healthier they are." It was bathing that was considered unhygienic, causing infertility and diminishing beauty. No less than the filth itself, the stench of filth was valued for its medicinal qualities, and also as a sexual stimulant. Victims of tuberculosis were advised to inhale animal vapors. The ardor of romantic suitors was awakened by the aroma of their loved ones' underarms. Goethe stole the bodice of a ladyfriend so that he could sniff it in private. The historian Michelet sought inspiration for his writing in a woman's menstrual odors, as well as through the scents of latrines.

12. Baydo [1982, p. 6] and Martin [1942, p. 432].

13. Transatlantic travel was certainly out of the question for all but the few wealthiest. An 1858 *Harper's Weekly* advertised a pleasure voyage on the Mediterranean aboard the steamer *Ericsson* for $750 per person (or close to the annual income of the average urban Massachusetts family of five described in section 3.3).

14. It may be of interest to note that, despite the advent of all the modern-day, worksaving household amenities, such as indoor plumbing, electric washing and drying machines, vacuum cleaners, canned goods, and ready-made clothing, some recent historical studies of housework conclude that the time women spend on household chores has not decreased. Modern amenities have dramatically reduced the back-breaking drudgery of many household tasks, but have also created different sorts of housework. For example, Cowan [1983] points out that when gas stoves replaced woodburning stoves, no longer did wood have to be chopped, split, and carried in (tasks often performed by men and children), but the task of cooking remained the same or became even more difficult (since meals no longer were limited by the vagaries of woodstoves). In fact, the amount of time spent on cooking increased as women produced meals much more complicated and nutritious than the one-pot stew dictated by primitive stoves. Similarly, Caroline Davidson [1982], in her history of housework in the British Isles from 1650 to 1950, concludes [p. 192],

> ... the spread of utilities and time- and labour-saving appliances did not have any discernible long-term effect on the average housewife's working hours. Time saved on one task was simply put to new use and the scope of housework redefined. A woman who saved an extra 45 minutes a day through the introduction of piped water into her house would use them to do more cleaning and washing. Similarly, a woman whose coal range was replaced with a gas stove would cook more elaborate meals than she had previously, because it was so much easier. In this way, housework remained a full-time occupation for most women in 1950, just as it had been in 1650 [or 1750 or 1850].

Cowan writes [1983, p. 201],

> ... there is more work for a mother to do in a modern home because there is no one left to help her with it. Almost all the work that once stereotypically fell to men has been mechanized. Families tend to live a considerable distance from the place where the male head of the household is employed; hence, men leave home early in the morning and return, frequently exhausted, late at night. Children spend long hours in school and, when school is over, have "after school activities," which someone must supervise and from which they must be transported. Older children move away from home as soon as they reasonably can, going off to college or to work. No one delivers anything ... to the door any longer, or at least not at prices that most people can afford; and domestic workers now earn salaries that have priced them out of the reach of all but the most affluent households. The advent of washing machines and dishwashers has eliminated the chores that men and children used to do as well as the accessory workers who once were willing and able to assist with the [other] work. The end result is that, although [house]work is more productive (more services are performed and more goods are produced, for every hour of work) and less laborious than it used to be, for most housewives it is just as time consuming and just as demanding.

15. The *New York Times* [1986, p. A19].

16. Figures for Massachusetts in 1870–1874, from U.S. Department of Commerce, Bureau of the Census [1975, p. 57].

17. Physical stature (height) is also a good measure of gains in the standard of living (and in fact may be a better measure than real wages or per-capita food consumption). Average height is apparently a nearly foolproof measure of the nutritional status of a population, particularly the nutritional status of the infant and child population.

18. For dramatic evidence on the decline of mortality and the contribution of scientific development, see Coale [1987].

19. As Scott and Wishy [1982] point out, "... even today, despite the use of vaccines, our annual 'flu' epidemics remind us mildly of the low odds against disease with which American families lived...." [p. 393].

20. Well into the twentieth century hospital wards were filled with cases of tuberculosis, pneumonia, syphilitic heart disease, pneumococcal and streptococcal meningitis, typhoid fever, and other acute, and at that time incurable, microbial diseases. As late as the 1930s, "... the physician more commonly 'shared' in the agonizing process of waiting for 'nature to take its course' or in helping patients cope with illness that could not be modified medically [as is, unhappily, true of AIDS in 1989]" (Rogers [1986, pp. 11–15]).

21. Legal requirements for practicing medicine were *very* unexacting: usually three years of study with a practicing physician and two courses of lectures at a medical college. Dentistry was a branch of doctoring, consisting largely of extractions, with ingested alcohol the only anesthetic available.

22. The data are reported and analyzed in Fogel [1986a, b]. Fogel offers some conjectures about the explanation of what he calls "the peerage paradox"—the approximately equal life expectancy of peers and commoners in the period noted. He suggests that many of the killer diseases of the time such as plague, malaria, smallpox, and typhus are affected minimally by nutrition, that cleanliness was not fashionable, and that upper-class diets of the period contained extraordinarily high quantities of substances (notably alcohol) toxic to the unborn or to the nursing child. Moreover, the aristocratic diet shunned healthful root vegetables and cereal products that economic circumstances often forced peasants to eat (Fogel [1986a, pp. 64–70]).

4 Long-Run Growth in U.S. Productivity: Is There a Slowdown?

This country's productivity growth in recent years is extremely disquieting. But the troubling trend is only symptomatic of much more serious productivity problems.
Baumol and McLennan [1985, p. 3]

Very preliminary inspection of the evidence initially convinced us that the United States had indeed experienced a sharp and sustained decline in its productivity growth, and that this represented a marked departure from its long-term performance, threatening grave consequences for the nation's future. Closer study of the facts has, however, forced us to acknowledge that this widely accepted judgment is simply incorrect. Not that the opposite is true. There clearly has been a short-term slowdown; but the evidence suggests that it is merely the end of an extraordinary period of postwar growth—a return toward normal growth rates—that was experienced in *all* industrial countries.

More than that. Much of the popular disquiet over U.S. productivity performance has centered on the manufacturing sector of the economy. We have all seen statements deploring the loss by our manufactures of their ability to hold their own against the incursions of foreign competition both in the domestic market and abroad. "Deindustrialization" has been inscribed on the banners of those who believe that the U.S. economy faces a profound long-term crisis. This will be studied in some detail in chapter 6. But here we shall already see that growth in productivity of our manufacturing continues high, and is, perhaps, even somewhat above the historical rate of expansion.

This chapter examines the pertinent evidence on productivity growth both for the economy as a whole, and (for the period after World War II) for each of 11 subsectors into which the available statistics subdivide the economy. While it is true that some of these sectors have shown signs of a slowdown, that by itself should hardly be considered to constitute a shock-

THE FREEMAN
Ideas On Liberty

Material Progress Over the Past Millennium

by E. Calvin Beisner

Reginald Labbe, an English farmer better off than most in his time, died in 1293. His will listed the following possessions:

- one cow and one calf
- two sheep and three lambs
- three hens
- a bushel and a half (about 90 pounds) of wheat
- a seam (about 400 pounds) of barley
- a seam and a half of fodder for cattle
- a seam of mixed grain
- clothing comprising a hood, a tunic, and a tabard (a short, heavy cape of coarse cloth)
- a bolster (a long, narrow pillow or cushion)
- a rug (used as a blanket)
- two sheets
- a tripod or trivet (for cooking food over a fire)[1]

Like most English farmers of the time, he had used tools (probably little more than a hoe and a scythe) belonging to his landlord—which meant, too, that he owned neither land nor dwelling. He had no money. The money value of his estate in his day was figured at 33 shillings 8 pence (1 pound 73 pence), or about $2.75 at today's exchange rate. But of course in his day a shilling bought a great deal more than it does now, after seven centuries of inflation.

What would his possessions have been worth had he died today? Precise calculation is impossible; we don't know the age, weight, or health of his livestock or the quality of his other possessions. But rough estimates put the total value of his livestock today at around $1,000 (assuming that they were smaller and less healthy than typical livestock today), his grain and fodder at around $475 wholesale, his tripod at around $10, and his clothing and bedding at nothing (because they would have been both very worn and of such inferior make that no one today would be willing to use them). The total value of his estate, then, might have been around $1,485 (or £935). For comparison, the average value of farms in the United States today is about $350,000.

When Labbe died, the executor sold off his possessions to pay expenses. He paid a penny sterling (about $8.65 today) for the grave to be dug; twopence ($17.28) for the tolling of the church bell; sixpence ($51.84) for making his will; eightpence ($69.12) for court fees; 46 pence ($397.44) for food for the mourners and pallbearers; and threepence ($25.92) for the clerk who drew up the account for the estate—a total of 66 pence ($570.25), or a little over a third of the value of his estate. (Of course, he was not embalmed and had no hermetically sealed, velvet-lined, stainless steel

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An earlier version of this article appeared in World *magazine (www.worldmag.com).*

casket to preserve his body for a thousand years.)

If Labbe lived to the average age of people born in the thirteenth century, he was under 30 when he died. More likely, since he had survived infancy and childhood (about half did not), he died in his 30s or 40s. Probably at least one wife had preceded him in death, perhaps in childbirth—one of the most common causes of death for women at the time. Assuming he had fathered eight children in his years of marriage, he would probably have buried four of them in their infancy, perhaps another before its fifth birthday, and another before puberty. If he was fairly typical, then, two of his children survived him.

Slow Population Growth

Such was life, for the moderately better off, in a society in which the death rate was normally so close to the birth rate that population grew at only about 0.17 percent per year, doubling about every 425 years instead of every 42 years, as it would at the world's average growth rate in the 1980s, or every 51 years, as it would at the average rate for the 1990s.[2] Even for the wealthy, life wasn't much more secure. Infant and child mortality rates were little better for the very rich—royalty and nobility—than they were for farmers and peasants, even into the eighteenth century. Britain's Queen Anne (1665–1714) was pregnant 18 times; five of her children survived birth; none survived childhood.

To be more precise, such is a tiny glimpse of life for people throughout most of the past millennium in countries that now are among the richest in the world. There is a good deal more to describe. Most of it is about as dismal by comparison with our experience.

You might have been surprised at the cost of the food served to the mourners and pallbearers at Labbe's funeral—by far the largest cost associated with his death. That is because food was far more expensive in the past, in comparison with labor and practically any manufactured product, than it is today. Agricultural yields were far lower, both per acre and per man-hour of labor.

Eighteenth-century French farming, for instance, produced about 345 pounds of wheat per acre; modern American farmers produce about 6.2 times as much, 2,150 pounds.[3] Early fifteenth-century French farmers produced about 2.75 to 3.7 pounds of wheat per man-hour, and the rate fell by about half over the next two centuries;[4] modern American farmers produce about 857 pounds per man-hour[5]—about 230 to 310 times as much as their French counterparts around 1400 and 460 to 620 times as much as French farmers around 1600. (By the way, this means modern farmers also manage to farm from 37 to 100 times as many acres as their earlier counterparts did. Chalk it up to mechanized equipment.) As the great French historian Fernand Braudel pointed out, life was difficult to live when productivity in wheat fell below 2.2 pounds per man-hour, but for most of the 350 years from 1540 to 1890, productivity was well below that.[6]

Such facts help to explain why earlier generations spent a major part of their incomes just on food (excluding its preparation, pack-

aging, transport, and serving), while we spend far less (under 6 percent of total consumer expenditures in the United States in the 1980s). These developments—along with the advent of glass windowpanes (to admit light and heat but exclude cold and pests) and screens (to admit fresh air and exclude disease-bearing insects); treatment of drinking water and sewage; mechanical refrigeration (to prevent food spoilage and consequent waste and disease); adoption of safer methods of work, travel, and recreation; and the advent of sanitary medical practices, to say nothing of antibiotics and modern surgical techniques—also help to explain why people live about three times as long now.

All this is just one way of looking at changes in human material conditions over the past millennium. Others also are important and instructive.

When Would You Rather Have Lived?

Try a thought experiment. Would you rather live as you do today, with your present income and expenditure patterns, or as royalty lived throughout the last millennium up to the late nineteenth century? It is tempting to pick the life of past royalty. But consider just a few of the things you would have to do without:

- Electricity and all it powers: lights, telephones, radios, televisions, refrigerators, air conditioners, fans, VCRs, X-rays, MRIs, computers, the Internet, high-speed printing presses, and all other industrial automation.
- Internal combustion engines and all that they power: cars, trucks, buses, planes, farm and construction equipment, and most trains and ships.
- Hundreds of synthetic materials like plastic, nylon, orlon, rayon, vinyl, and the thousands of products—from grocery bags and pantyhose to compact disks and artificial body joints and organ parts—made from them.

None of these things were available to anyone, at any price.

No matter how rich you might have been a millennium—or even 150 years—ago, if you'd contracted a bacterial disease, you could not have been treated with antibiotics. If you had wanted to travel from Great Britain to Australia, you could not have done so in less than months, at great discomfort and great risk, not in less than a day and at less risk than driving across London. You could not have enjoyed air conditioning or iced drinks during a hot summer. You could not have talked with anyone by any means other than direct voice. Until the advent of the telegraph in the second quarter of the nineteenth century, you could not have communicated at a distance in writing any faster than you could have traveled; and it was decades later before telegraphic communication was readily available to most cities and towns. You could not have taken or viewed photographs, listened to recorded music, or viewed—let alone made your own!—motion pictures.

Yes, the few rich of the past lived in opulence. (Don't think of castles, most of which were cramped and quite uncomfortable, built for defense rather than comfort.) Think of the great mansions like Blenheim Palace in Oxfordshire, the Château Fontainebleau in France, or even, here in the United States, the Biltmore House in Asheville, North Carolina. Or picture the homes of royalty, like Buckingham Palace or Hampton Court in London, or the Palace of Versailles in France.

But however opulent the surroundings, with their magnificent architecture, gardens, carpets, furniture, china, silver services, and art collections, they were not very comfortable. Heating and especially cooling these mansions were constant problems. They were far less sanitary, and far more smelly, than most lower-class dwellings today. Indeed, the very magnificence of the dwellings of the rich is testimony to the absence, in a pre- or primitive-market culture, of other, more attractive uses of their wealth. A higher proportion of people in advanced countries today can afford to build and furnish great mansions than could in centuries past. But they don't. Why not? Because most of them invest their wealth in productive enterprises or spend it on travel and entertainment instead.

And sanitation? The literary historian James Clifford, after years of note-taking on every reference he could find to sanitation in London, wrote an article that American historian Bernard Bailyn described simply as "horrifying."[7] "A bathroom was a very rare luxury in . . . seventeenth- and eighteenth-century houses. Fleas, lice and bugs conquered London as well as Paris, rich interiors as well as poor," wrote Braudel. "So if we moderns were to enter into an interior of the past, we would very soon feel uncomfortable. However beautiful it might be—and it was often wonderfully so—what seemed like luxury to the people of the past would not be enough for us."[8]

Overland travel even for the rich was by horseback or carriage, and the 450-mile journey from London to Edinburgh, driven by lower-class car owners today in a comfortable seven hours or flown in an hour, required two 18-hour days in a bumpy carriage with neither air conditioning nor heat. For the poor, travel was almost entirely on foot.

Keep the Doctor Away

Medical care? You don't even want to imagine most of it. There were no more effective anesthetics than alcohol and cloves, so when limbs gone gangrenous from infections that would be cured or more likely prevented easily today had to be amputated, patients gritted their teeth and hoped they would pass out from the pain of the crude saws. Germ control? Nonexistent. The germ theory of disease didn't become current until the late eighteenth century, and the use of antiseptics didn't begin until half a century later. Even then, what your doctor didn't know could kill you. The high rate of maternal death in childbirth in early nineteenth-century America is attributable in part to belief in "laudable pus." Doctors believed pus itself was curative, so they would purposely spread it from patient to patient, including to mothers in childbirth.[9] Got a fever? Don't call the doctor; he's likely to bleed you to death trying to cure it. In fact, medicine was so primitive it was a favorite cover for spies; physicians were trusted everywhere, but it took little knowledge to pass for one.[10]

Education was the province of the rich. Few countries before the Reformation had widespread education, and even afterward, schooling was available principally to the rich. A major exception was Scotland after John Knox's followers, convinced that personal knowledge of the Word of God was essential to the maintenance of religious as well as civil liberty, arranged a parish-by-parish system of church-run grammar schools which ensured that practically every child could at least become strongly literate. Scotland's high literacy rate, coupled with its Calvinist ethics of work and saving, were important factors in its making contributions to the Industrial Revolution far out of proportion to its small population. But even there, few were schooled for more than five or six years, and only a tiny percentage attended college, let alone graduated.

Today, by contrast, in the United States, 81 percent of persons 25 years old and over are high school graduates and 23 percent are college graduates, and the growth in availability of education is worldwide. That is a particularly crucial factor in predicting the world's material future, because the creation of wealth depends primarily not on brawn but on brain.

The bottom line? Materially, the world is a far, far better place today than it was not only a millennium ago but even a century ago. Today, every raw material—mineral, plant, and vegetable—is more affordable (which economists will recognize as meaning more abundant), in terms of labor costs, than at any time in the past. Every manufactured product is more affordable than it has ever been. And in producing all this great abundance, we have also reduced health-threatening pollution. Put simply, the world is both a wealthier and a healthier place today than ever.

The most crucial measures of material welfare are mortality rates and life expectancy, since most people value preserving life more than any other material good. A thousand years ago, life expectancy everywhere was under 30 years; today, worldwide, it is over 65 years, and in high-income economies it is over 76 years. The under-five mortality rate has plummeted from about 40 percent every-

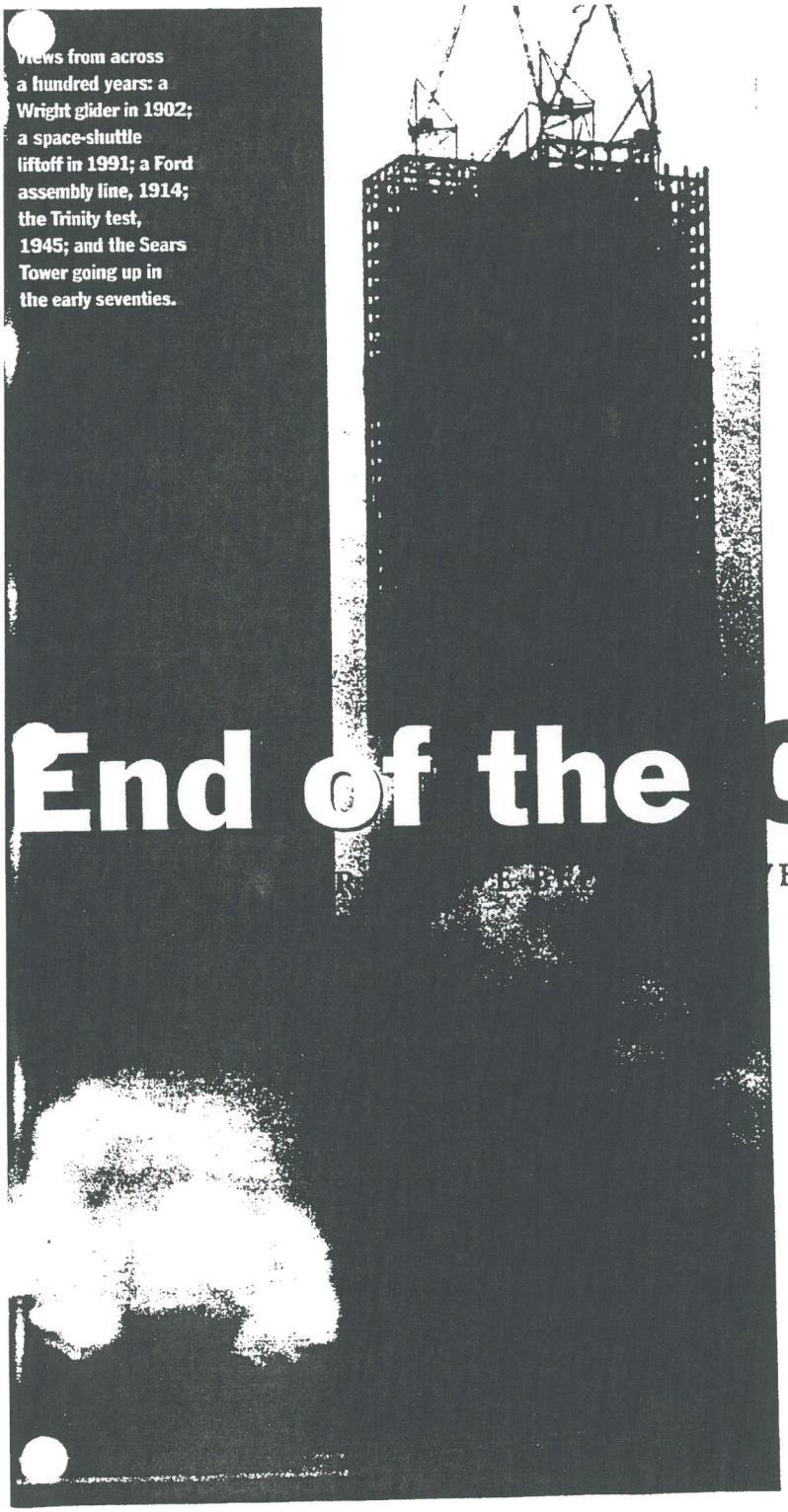
where as late as the nineteenth century to under 7 percent worldwide today, and under 1 percent in high-income countries. And improved life expectancy comes not just from declining child mortality but from declining mortality rates at every age of life.

The late economist and statistician Julian Simon, a friend and mentor, produced in 1995 as his last major editing effort a big book, *The State of Humanity*, to show long-term trends in hundreds of material measures of human well-being. Parts cover such categories as life, death, and health; standard of living, productivity, and poverty; natural resources; agriculture, food, land, and water; and pollution and the environment. Want to know long-term trends in slavery, housing quality and affordability, leisure time, energy resources, forest growth, crop and livestock productivity, air and water pollution, disease, murder and suicide, even accident rates? They're all there, in chapters by 60 world-class scholars.

"This is the central assertion of this book," Simon wrote: "Almost every absolute change, and the absolute component of almost every economic and social change or trend, points in a positive direction, as long as we view the matter over a reasonably long period of time. That is, all aspects of material human welfare are improving in the aggregate.[11]

Simon's view has raised eyebrows through the years, but the empirical evidence supports it overwhelmingly. If you're looking for a good way to get a grasp of the material changes we've experienced over the last millennium, *The State of Humanity* would be a great place to start. □

1. Russell Kirk, *Economics: Work and Prosperity* (Pensacola: A Beka Book, 1989), pp. 250–51.
2. Fernand Braudel, *Civilization and Capitalism: 15th–18th Century*, 3 volumes, volume 1, *The Structures of Everyday Life*, trans. Sian Reynolds (New York: Harper & Row, 1985), p. 41.
3. Computed from ibid., p. 121, and *Statistical Abstract of the United States, 1996*, Table 1105.
4. Computed from Braudel, p. 135.
5. Computed from E. Calvin Beisner, *Prospects for Growth: A Biblical View of Population, Resources, and the Future* (Wheaton, Ill.: Crossway Books, 1990), p. 127.
6. Computed from Braudel, p. 135.
7. Bernard Bailyn, *On the Teaching and Writing of History* (Hanover, N.H.: Dartmouth College, 1994), p. 51.
8. Braudel, pp. 310–11.
9. Private communication from Philip T. Newton, M.D.
10. Alan Marshall, *Intelligence and Espionage in the Reign of Charles II, 1660–1685* (Cambridge: Cambridge University Press, 1994).
11. Julian L. Simon, ed., *The State of Humanity* (Cambridge, Mass.: Blackwell Publishers, 1995), p. 7.



Views from across a hundred years: a Wright glider in 1902; a space-shuttle liftoff in 1991; a Ford assembly line, 1914; the Trinity test, 1945; and the Sears Tower going up in the early seventies.

LOS ALAMOS NATIONAL LABORATORY; SKIDMORE, OWINGS, AND MERRILL

End of the Century

WHERE WE MAY BE GOING

LAST SUMMER MY EMPLOYERS ASKED ME, AND quite a few other people at the company that owns this magazine, to attend a one-day management-training seminar given by a management consultant in a conference center high above Wall Street. Our activities included the parlor-game-like exercise of answering a long list of questions to find out the personality type of each of us, followed by some serious reflection about how every personality type is important in an organization, but before all that we were introduced to the importance of up-to-date management skills with a lecture about how the world has changed lately.

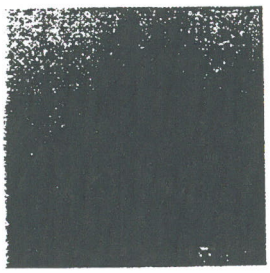
Our brisk, cheerful instructor informed us that from the 1700s until very recently, Newtonian science was the underpinning of civilization, and it led us to make our organizations above all stable. The future was usually fairly predictable, so the smart way for a company to prepare was to send its managers on a retreat to formulate a five-year plan. In the last twenty years, she went on, that has been overturned—all because of technology. We have entered a new "information age" where "chaos" has become the operational model, where the future is completely unpredictable, and "changes are discontinuous and happening at a geometric rate." In sum, "Whereas a Newtonian view of the world imposes structure on an organization from above, the biological model, represented by chaos theory, views the organization as a living, self-organizing system." So we'd better keep on our toes at the office.

At the end of this lecture one member of our group with a historical sensibility raised his hand to suggest that no job on earth was more unpredictable, perilous, and requiring of constant adaptation than being a farmer in the year 1800. What most struck me, though, about this division of all history into halcyon past and alarmingly technology-frenzied present was what a popular view was being presented. As Robert Friedel points

BY FREDERICK ALLEN

out in his article in this issue, this sort of talk about how change has lately sped way up is rampant. One current bestseller is devoted to the idea—*Faster: The Acceleration of Just About Everything* by James Gleick.

Are we really in an age disconnected from the past? Of course not, as Friedel illustrates wonderfully in his article (and as I hope every article we publish suggests). Is the pace of technological change really so much faster? Look at the last turn of the century, when 1899 became 1900.



Here are some of the things that were happening then. In 1899, 2,500 automobiles were manufactured. That was a first trickle in what would become a torrent, but they were already beginning to remake the American landscape. In September of that same year, the first automobile death occurred in New York City. Already the new industry was a cutthroat place, with most of the makers pushing hard to establish either steam or electricity as the power source of choice, a battle they would both lose as internal combustion won out over the next two decades, during which the number of cars would rise to more than four million. Whole industries were about to spring up or be driven under in connection with the automobile. Also in 1899, two bicycle mechanics—bicycles had been the hot new transportation technology just a few years before—named Wright were making the key discoveries about the requirements for controlled flight that would enable them to invent the airplane four years later.

In the previous 20 years the number of electrical generating plants in the country had grown from 1 to 2,000; in less time than that street railways had expanded from almost none to more than 22,000 miles' worth; the first electrified factory had been built in 1894, yet by 1901 there were nearly 400,000 industrial motors at work. As a result of these and other recent developments, more than half the nation's output was manufactured goods and only a third agricultural—a complete reversal in 30 years. An information revolution was going on too. In 1901 there was a telephone in one of 10 American homes, a number that would grow by leaps and bounds, and the instrument was transforming the way people lived and did business—a process gotten well under way by the telegraph before it—knitting together the world into a vast interlocking web where the instant spread of information required constant reaction and adaptation. Any kind of business had become immensely more volatile. And radio would appear within a generation, triggering yet another communications revolution.

It is fair to say that the greatest revolution of our century is nc communication and computing a

These changes often had brutal effects. In the previous presidential election, in 1896, William Jennings Bryan, the Democratic candidate, had given the speech in which he proclaimed, "You shall not crucify mankind upon a cross of gold," confirming the gold-versus-silver debate as the central national political issue. That debate was, just beneath the surface, about nothing other than technological change overthrowing people's lives. Western and Southern farmers were feeling squeezed by Eastern bankers; in fact their traditional livelihoods were being made obsolete, overtaken by the industrialization of farming, the result of innovations such as reapers, harvesters, self-binders, combines, selective breeding, grain elevators, the new canning industry, industrialized baking and dairy-product manufacture, infrastructures of railroads and telegraphs, and the rise of urban markets for all the goods thus being ever more economically and industrially produced.

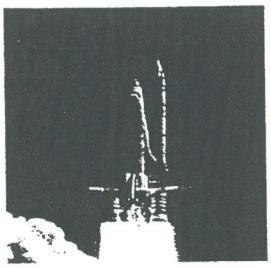
Life in 1899 would have been unrecognizable to someone from 1799, in all these ways and in other major ways we take for granted, among them that indoor plumbing and mass newspapers had both gone from nonexistent to commonplace. Life changed at least as much in the century before 1900 as it has since. America had become an urban nation, with instant mass communication, with mass production and mass markets and rapid transportation all through the country. You could send a message from coast to coast in a second or travel the same distance in a matter of days (far closer to today's hours than to 1799's months). You could commute to work, shop in department stores or over the phone, make night day inside your house at the flick of a switch, read news from around the world a few hours after it happened.

In one major way life was closer to 1800 than today: in medicine and health. The simplest, most basic, but also indisputable measure of this is life expectancy. There are no figures for life expectancy in the United States in 1800, but in 1900 it was still only 47, which cannot be a great deal higher than a century before. Today it is around 77. A hundred years ago doctors were still learning to accept the germ theory of disease. Anesthesia and vaccination and disinfection had become commonplace, though in nothing like the sophisticated forms they take today, but beyond those advances most treatment of illness was little better than in the Middle Ages. In this century medicine has changed beyond recognition. The list of accomplish-

ments is dazzling: sulfonamide drugs; antibiotics, beginning with penicillin; antituberculous drugs; weapons to conquer typhoid, tetanus, and diphtheria; antiviral agents against, among other illnesses, yellow fever, polio, measles, and German measles; insulin and cortisone; surgical techniques to make formerly deadly ills such as appendicitis almost trivial and to combat various cancers; chemotherapies; neurosurgery; plastic surgery; heart surgery. All those are from the first three-quarters of this century; the last 25 years have added major new drugs against cancer, heart disease, ulcers, and mental disorders, among other conditions; the routine transplanting of livers, lungs, kidneys, and other organs; radically improved diagnostic and surgical techniques; and gene therapies. Indeed, there is no area of medicine that has not changed greatly in the last quarter-century.

technological in information and all; it is in health.

So, 100 years ago we didn't have an Internet or cell phones, but we did have networks of telegraphs and telephones for instant communication around the world; we didn't have superhighways or 747s, but we did have trains and steamships reducing the longest journey to a tiny fraction of the time it had taken only decades before; we didn't have television, but we did have motion pictures, and we had newspapers bringing us nearly instant news. We didn't have modern medicine, and there, there is no "but." It is fair to say that the greatest technological revolution of our century—and still at this end of this century and going into the next one—is not in information and communication and computing at all; it is in health. The information revolution may be changing life and business as we speak, but a great many of us are here to speak at all only because of what has happened in medicine.



Why do we tend to so take for granted, or not even notice, the change that lies behind us and see all the change around us right now as so unprecedentedly sweeping? I think there are several reasons, a couple of them trivial or obvious but one important and usually overlooked. The trivial reasons are, first, because the present is when we're living, so of course we're much more aware of its events, and, second, because it's the business of business to convince us that everything is speeding up, while promising us the key to coping. Thus an NEC ad begins, "Change is the only constant. Success is fleeting. Challenges are hurled relentlessly from all directions." Lucent informs us, "There's a communications revolution going on. And one company is right in the center of it." Bill Gates calls his latest book *Business @ the Speed of Thought*.

The more easily overlooked reason—not that it's any more subtle than the first two—arises from the basic fact that all of technology is about nothing but increasing human power and comfort and ease. Because it has this universal goal, it has a very strong tendency to make itself invisible. It succeeds best when it not only enhances our power and pleasure but also removes itself from intruding between us and them. You want a car that will not only get you where you're going but start right up in any weather without your thinking about it, a medication you can take effortlessly in pill form rather than as an injection, a phone system and cable provider and electrical network that will never demand your attention, an air conditioner that is noiseless, and so on. The only seeming exceptions are where pleasure or comfort or ease trumps invisibility (sometimes perversely), as in the case of deafening straight exhaust pipes on motorcycles or car alarms that reassure us by waking up the neighborhood at the least disturbance.

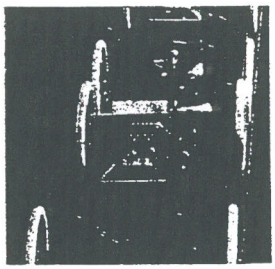
The fact that technology tends to disappear ensures that we will take much of it, when it works right, for granted; its job is to be taken for granted. And because of that, we stay most aware of technologies that are changing rapidly or are grossly immature. Right now we're especially aware of the Internet precisely because of its youth. If we try to, we can still remember the personal computer—that is, remember when it stirred the same kind of excitement the Internet does now (or did a year or two ago). That would have been back around 1981, which was when IBM introduced the PC. In 1981 Tracy Kidder published *The Soul of a New Machine*, a book that became a bestseller and won a Pulitzer Prize because it told, very well, the story of the development of a new computer chip in the late 1970s. The wonder that personal computers inspired then cannot exist today because for two decades the technology has made itself ordinary, by making itself serve us ever more effortlessly and pleasingly. We have even begun to forget how frustrated we were by Microsoft Windows a couple of years back.

One byproduct of invisibility is that once a technology becomes truly mature we tend not to fully appreciate its further improvements, even when they're substantial. Automobiles reached maturity by about 1970 at the latest, having become as big and powerful and fast and generally comfortable as they ever would, with automatic transmissions, power steering, power brakes, and fuel injection, and the changes to them since then appear mainly to have been refinements. Yet consider those refinements. When you bought a new car in 1970, you typically brought it home knowing you'd be going through a grueling few months

having all the factory defects fixed. You would expect to suffer through the occasional overheating and dangerous blowout. The car would almost certainly handle worse than any cheap car you can buy today and have inferior crash resistance, passenger protection, fuel economy, and pollution control. Moreover, you'd feel lucky if you got 70,000 miles out of it. It was nothing like an automobile today, but the differences are all things you now take for granted—and should.

The price of invisibility is an underappreciation of the richness and depth of the technological change all around us, or at least of all that technological change that isn't thrusting itself into our consciousness at the present instant. And that underappreciation in turn allows us more easily to believe that change is quickening (because earlier change has disappeared from view), that we have just lately given up a more natural world for a technological one (likewise because earlier change is concealed), and that the past was a better place (because technology allows us to forget all the ways the past was more difficult and hazardous and painful).

Of course most of us probably harbor some inclination to look at time past and present this way anyway, just because of the universal fact that our own lives get shorter and have ever less time in them. As we lament the passing of personal time, we can find that all the past was youth and innocence and freedom and all the future is decline, as Lord Byron recognized when he wrote, "The 'good old times'—all times when old are good . . ." or Eugene O'Neill when he observed that "only the past when you were happy is real."



Granted, then, that we're not particularly good at observing and appreciating our technologies (and it is a useful thing that their shortcomings always stand out most glaringly), what can we make out about the larger shape of technological change in the past century? Certainly that it has remade life both on the broadest global scale and on the smallest individual scale. The historian of technology Thomas P. Hughes has suggested that as the Western frontier was closed in the nineteenth century, it was replaced by a technological frontier in the twentieth. The national drama that was westering was replaced by one of opening and exploring new technological realms. He writes that "during the late eighteenth and early nineteenth centuries, the United States was nature's nation. By the twentieth, it had become technology's nation. Americans had transformed a natural world into a human-built one characterized by technological systems and unmatched complexity. In doing so, they demonstrated a technological prowess unequaled elsewhere in the world." He has even suggested that future historians will compare America's technological flowering to "such remarkable eras as the Renaissance period in Italy or the Victorian period in Great Britain."

Has all this change been, on balance, for better or for worse? Unarguably, by any simple measure, for better. Life expectancy has leapt not only in America but also, more surprisingly, worldwide. Even among poor countries it has risen from less than 40 in 1950 to 61 today (though it has recently fallen in some African nations because of AIDS), and the improvement is largely a result of the spread of Western medical and agricultural technologies. Of course the benefits of development have not been evenly shared, and they are greatest in America and elsewhere in the developed world. But in this nation we all live better in almost any material sense than we did a century ago, in far improved comfort. Modern electricity and plumbing and refrigeration and health care alone give us immeasurable advantages over our great-grandparents. And even the poor are better off. For the most part, poverty in America is nowhere near as harrowing as it once was. Not only is malnutrition almost gone from the landscape, but many poor households maintain living standards not long ago thought middle-class. Studies show that nearly half of poor households had air conditioners in the 1990s, whereas fewer than a third of all households did in 1971, and the same holds true for dryers, refrigerators, stoves, microwaves, and color televisions. Likewise, 2 percent of the poorest 9 percent of the population had credit cards in 1970; today the number is above 26 percent.

Technology has raised our general comfort level and showered us with material possessions. Yet the question remains, Is life really better? Of course there have been tradeoffs of all sorts and sizes, and there have been technological devastations: wars made unprecedentedly deadly by the technological prowess we were able to deploy; environmental problems of vast scale and complexity, from acid rain to the destruction of the Amazon rain forest and, most subtle, immeasurable, and possibly far-reaching, and thus vexing, of all, global warming. Indeed, there is nowhere to escape

Technology is nothing but humar we may like tc

such problems, no place untouched by the handprint of man's work, man's technology. The entire environment is a built environment now. The hand of man changes everything, and thus man's every move carries grave responsibility.

Can one say if, on balance, technology has made life better at the end of this century than at the beginning? Beyond the sort of simple, crude measures I mentioned, the question is of course an impossible one, since there is no way to calculate so personal

interest makes a stand, lobbyists exert what influence they can, lawmakers bicker, contractors change things, Congress struggles with costs, environmentalists hold things up—and this is good. It may seem amazing that anything gets done, but when it does, everyone has had their say. It's an intensely democratic, even if expensive and time-consuming, process.

With such adaptive forms of planning, with our many kinds of regulations, with lawsuits—all very disorderly but all necessary—we have been working to equip ourselves to rein in our technologies. We have also shown that if we really want less-polluting cars and cleaner rivers, we can get them. At the same time, the very uncontrollability of the Internet has become a democratizing force. In China underground opposition movements have organized and sustained themselves on-line. Amnesty International reports that word of human rights violations spreads much more quickly and easily now thanks to the Internet.

None of which is to say that the challenges that our ever more complex and all-encompassing technologies present don't keep growing just as fast as all the rewards we reap. Where will it all lead? One thing everybody knows is that nobody can predict the future, in technology or in anything else. No one can guess what wonders and horrors lie ahead. But one can predict what the future will feel like for most people living there. It will feel pretty much the same. If all the changes we have been through in the past century have not made people believe themselves substantially better off or worse off, or indeed anything but perfectly ordinary most of the time, if they have left us generally forgetful of the distances we have traveled, the changes that are to come can hardly do otherwise. People will continue to be devastated in times of war and other large-scale trauma and will continue to go on with their lives as they always have the rest of the time. Technology will provide no miracles that feel like miracles for long.

This is not only because of technology's genius for becoming invisible but also because of its amazing gift for becoming, even when not invisible, perfectly ordinary. In 1907 the journalist and social reformer Charlotte Perkins Gilman wrote in *Harper's* magazine that anyone who had flown in an airplane "cannot think of himself further as a worm of the dust, but [only] as butterfly, psyche, the risen soul." Three years later a woman watching the first airplane flight over Chicago wrote that "we bowed our heads before the mystery of it and then lifted our eyes with a new feeling in our souls that seemed to link us with the great dome of heaven, stretching above and over all, and hope sprang eternal for the great new future of the world." If ever a technological novelty introduced magic to the human experience, it was the airplane. Yet how much like a butterfly did you feel the last time you flew? Did hope for a great new future spring even temporary?

We will continue to dream about technology and how it can liberate us. When we're not being irked by its immature or quickly changing aspects or deleterious side effects, we will continue to raise our hopes for future pleasures from it. Depending on our nature, our dreams might be of a newer, better car or computer, of high-tech golf clubs that will improve our game, of more effective tools to do our job with, of high-speed rail systems overthrowing the tyranny of the automobile, of a cure for world hunger. Regrettably, there are probably few of us who honestly concentrate our hopes on that last item. But that is because, above all, we dream of power and comfort and ease—the very things all our technologies are about—and about as many of us ever feel we've already got enough power and comfort and ease as ever feel we've already got enough money. And we're not going to stop dreaming. "Don't part with your illusions," Mark Twain once wrote. "When they are gone you may still exist but you have ceased to live."

In a way, such dreams were the very thing my management-training session was about. It was about the dream of power and ease specifically in the workplace, of relaxed authority in piloting through a tumultuous world. If such dreams ever faded, we might reach a point where we found contentment with our technologies, where we decided we had built enough, that we had made ourselves truly happy with our machines and our endless reconfiguring of the world around us, or that we couldn't do much better. And we would stop trying to improve life, both for ourselves and for others. It won't happen. We are much too good at accomplishing ever-greater miracles, watching them become everyday commonplaces, and seeing their complexities and side effects multiply until we must avert our gaze forward to the next miracle to come, ever to stop and be satisfied. ★

Technology has a genius for becoming invisible—or, when not invisible, perfectly ordinary. But we'll continue to dream about how it can liberate us.

How Juice Went From Stone Age to Ice Age

By Sidney Mintz

The recent death of C.D. Atkins, the inventor of frozen orange juice concentrate, brings back memories of a world now lost, when the foods we ate still had seasons. The new concentrate was perfected during World War II, and came to mark the beginning of that perpetual challenge to Western technology—to make everything that is edible available all the time, and everywhere. No one dwells overlong on why this is such a good idea, but consumers seem persuaded that it is.

Anyone who has ever eaten an orange is captivated by its taste. The juice is a stimulating, sweet-and-acid essence, the fruit's "soul." But it used to lose its distinctive taste when canned. Concentrating and freezing, with a last-minute addition of fresh juice to enhance the taste, emerged as a brilliant solution.

Atkins and Edwin L. Moore—now in his 80s, and still in his lab every day—co-invented the concentrate method. Together with Louis MacDowell, they were researchers at the Florida Citrus Commission. During 1942-44, they worked to optimize the use of Florida's oranges, while responding to the government's request for a juice that could readily be shipped to troops overseas.

The evaporation method had been tried before; experimenters had been tinkering with the idea since 1925. But it was Atkins and his colleagues who made a success of it. First, they concentrated the juice by evaporation in a pressurized vacuum, with temperatures near 80 degrees Farenheit. When they added fresh juice afterward—10% proved the right amount—they were able to restore flavor and standardize the solids content. The product was canned and vacuum sealed, then passed through a freezing tunnel before shipment. This "cutback process" afforded huge savings to the agricultural producers. It also sparked the expansion of Florida orchards and collateral industries such as canning.

The invention of frozen orange juice from concentrate made her life easier.

In 1946 Mr. Moore, Atkins and MacDowell were granted a patent for the process, which they then assigned to the U.S. government, because the laboratory in which the research had been done was a federal one. Neither Atkins, nor his co-workers, ever complained about the riches they lost out on.

By 1947, sales of orange juice concentrate had outstripped those of peas and strawberries, the previous frozen food leaders. By 1953, a fifth of the frozen food market had been commandeered by orange juice. Soon, upscale restaurants would make "fresh squeezed" their proud breakfast boast, in contrast to the concentrated product that in most places served as fruit juice, and to which most Americans had become accustomed.

The success of frozen concentrate relied on the disposition of housewives, at whom the message of convenience and efficiency was beamed. The American Can Company vaunted its contribution to the happiness of the homemaker: In 1951-52, it claimed, frozen juice concentrate had saved the American housewife 14,000 woman-years of drudgery. That amounts to a trivial saving per housewife, but it was effective rhetoric.

Atkins' and his colleagues' invention is less valued today. Trendy consumers now prefer "NFC" (not from concentrate). In 1998, for the first time, NFC exceeded concentrate in popularity, capturing 51% of juice sales nationwide. Last year, Tropicana Premium claimed fourth place among grocery brand names, after Coke, Pepsi and Campbell's Soup.

The change in juice preferences is driven by the growing prosperity of the middle class: Two incomes have come to mean, among other things, both having NFC juice *and* sparing the housewife—or, more likely these days, working mother. Because consumers see NFC as a "choice" product, it sells at a substantially higher price than old-fashioned OJ, which is why juice from concentrate continues to be poured in America's diners and cafeterias, hotels and colleges.

In the half century since its invention, concentrated orange juice has gone from being regarded as a miracle to being seen as utterly humdrum by all, especially food snobs who insist on "fresh-squeezed." There can be no finer tribute to the genius of Atkins and his colleagues: Most great inventions appear obvious after the fact.

Mr. Mintz is professor emeritus of anthropology at Johns Hopkins University and author of "Tasting Food, Tasting Freedom: Excursions into Eating, Culture and the Past" (Beacon Press, 1996).

WSJ 6/22/00

Taking Good Health for Granted

By Theodore Dalrymple

At the end of the second millennium, we take medical progress for granted. More research equals more knowledge equals better health. And we assume, almost as if it were a human right, that an increase in life expectancy is part of the natural order of things.

We are not entirely wrong in our assumption, at least in relation to the future. Not only is there as yet no sign that we have reached the upper limit of human longevity—life expectancies continue to rise everywhere except Africa and Russia—but people are healthier in their old age than ever before. A combination of changes in lifestyle and improved medical care probably accounts for this. Our lives will almost certainly continue to become longer and healthier yet.

But when we project our assumption of never-ending progress back into the past, we are mistaken. It is wrong to assume that progress was so smoothly continuous that it amounted to a natural or inevitable state of affairs. On the contrary, the average life expectancy in ancient Rome was 25; in Hanoverian London, in the middle of the 18th century, it was—25.

A Little Better

No doubt there were times and places when things were a little better (it has been estimated, for example, that the life expectancy of the Aztecs, before the arrival of the Spanish, was 37 years). But only since the middle or end of the 18th century has there been a continuous improvement in the health of whole populations.

In other words, the institutionalization of progress is of comparatively recent origin, and is historically quite exceptional. We are apt to forget also how recently conditions prevailed that would now appall us. For example, the infant mortality rate in the London borough in which my father was born in 1909 was 124. That is to say, of 1,000 children born alive, 124 were dead before their first birthday. And London was then by quite a long way the healthiest of the large European capital cities.

Even by 1909, however, progress had been considerable. In my father's day, "only" two out of 10 children died before they were five years old; a century and a half earlier, the figure would have been more than five out of 10. Nowadays, by contrast, fewer than one in a hundred children die before their fifth birthday.

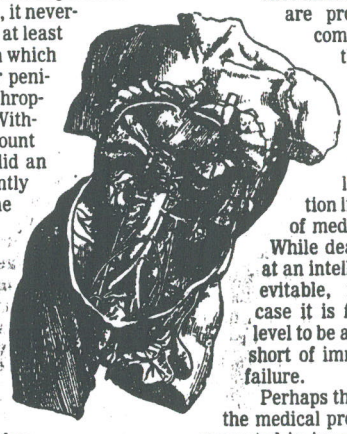
It took 200 years for the life chances of people in Europe and North America to be transformed so dramatically for the better, but it has taken a much shorter time in most of the Third World. Several Latin American countries now have longer life expectancies than England had at the time of my birth, and even in India the life expectancy far exceeds that of my father when he was born.

Curiously, though, the expansion in medical knowledge long preceded the improvement in any population's health. It was several hundred years before knowledge became power. For half of our millennium, a stultifying orthodoxy, based on the teachings of the Roman physician Galen, held sway. Even when his teachings were obviously wrong—he based his human anatomy on that of the pig—they were closely adhered to, and to question them was practically heretical. For hundreds of years, it was considered beneath a physician's dignity actually to examine a patient, an attitude that lasted in attenuated form until well into the 19th century. A physician was expected to pontificate in learned fashion, preferably in Latin, not to draw conclusions from mere sensory evidence.

Even when, eventually, medical men began to adopt a more empirical approach, it was a long time before patients actually derived any tangible benefit from it. The decisive turning point in philosophical attitude is usually said to have occurred in 1543, when the Belgian anatomist Andreas Vesalius published his "De humani corporis fabrica" ("The Fabric of the Human Body"). For the first time, human anatomy was based upon what was seen at dissection rather than what ancient authorities described. But Vesalius's work, epoch-making as it was, saved not a single human life.

The fact that there were once millions worse off than we are provides us with no comfort; the fact that there will certainly be millions better off is a kind of torment.

Eighty-five years later, in 1628, the English physician William Harvey published his "De motu cordis et sanguinis" ("The Motion of the Heart and Blood"), establishing the circulation of the blood. Widely regarded as the greatest book of experimental physiology ever written, it nevertheless saved no one's life, at least not directly, in the sense in which the discovery of insulin or penicillin did so. Not until the Shropshire physician William Withering published his "Account of the Foxglove" in 1785 did an effective (though frequently toxic) cardiac drug become widely available. Withering learned about the digitalis-containing plant from a local herbalist. Curiously enough, I still occasionally encounter ordinary folk who accidentally poison themselves by drinking tea made from the foxgloves in their garden, which they take when they feel slightly under the weather.



For untold centuries doctors used drugs that were at best useless and at worst poisonous. Not without reason did Oliver Wendell Holmes remark in the 19th century that if the whole pharmacopoeia were thrown into the sea it would be the better for mankind and the worse for the fishes. In the second half of that century, the physician John Hastings advocated boa-constrictor droppings dissolved in half a gallon of water as a cure for tuberculosis. Compounds of mercury, lead, antimony and arsenic were widely used; a British pharmacopoeia dating from 1917 suggests the following indications for the use of arsenic: acne, Addison's disease, anemia, asthma, cancer, cardiac weakness, chorea, dental caries, diabetes mellitus, dyspepsia, eczema, epilepsy, furunculosis, gout, Graves' disease, Hodgkin's disease, leukemia, lupus, malaria, malnutrition, neuralgia, osteomalacia, pellagra, pemphigus, pernicious anaernia, psoriasis, pulmonary tuberculosis, rheumatoid arthritis, rickets, scrofula, trypanosomiasis and urticaria. The wonder, then, is that anyone escaped arsenic poisoning (D.H. Lawrence was offered the arsenic treatment for his TB as late as the 1920s). The list of indications for lead in the pharmacopoeia treatment is almost as long.

We laugh at our foolish ancestors, but only very belatedly in the history of medicine has the realization dawned that a doctor's vague impression or even confident assertion that a treatment works is not proof, for he is naturally biased in favor of his own treatments. The principle of the controlled trial of treatments is one of the most momentous discoveries of our age, which has revolutionized medicine and for the first time turned therapeutics into a genuine science.

Does human contentment increase in tandem with technical progress? Alas no. We forget our own pasts all too readily, even when they are only a few years old (who now remembers the days when we had to have smallpox vaccinations to travel?). The fact that people in the not distant past died much younger and suffered physical torments of the kind we are almost all spared nowadays does not console us in the least when we are ill, or even merely worried about becoming ill.

A Kind of Torment

No. we compare ourselves not with our ancestors but with our descendents, who will suffer from illness even less than we because of the continual progress made by medical science. The fact that there were once millions worse off than we are provides us with no comfort; the fact that there will certainly be millions better off is a kind of torment. Many of my patients nowadays simply refuse to believe that any condition lies beyond the power of medical science to cure. While death is acknowledged at an intellectual level to be inevitable, in each individual case it is felt at an emotional level to be anomalous. Anything short of immortality is medical failure.

Perhaps this helps explain why the medical profession seems to be respected in inverse proportion to its actual ability to cure disease. It was lionized when it could do practically nothing (it was not until 1930, according to one medical historian, that a visit to the doctor was more likely to benefit the patient than damage him). Yet now that its powers are so formidable, it is regarded with cynicism and disrespect. For all our discontents, however, no one would wish to return to the days before antibiotics, X-rays, aseptic surgery, anesthesia and so forth. Before the medical progress of the past handful of decades, the most trivial injury or illness could—and often did—result in death. We lead more comfortable lives than any people have ever led in the history of mankind, and this is in no small part due to the triumph of medical science. The problem is, we don't really appreciate it.

Theodore Dalrymple is the pen name of Anthony Daniels, a British physician and contributing editor of City Journal.