Merit Students Encyclopedia

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MERIT STUDENTS ENCYCLOPEDIA

WILLIAM D. HALSEY
EDITORIAL DIRECTOR
LOUIS SHORES
SENIOR LIBRARY ADVISOR

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ALPHABETICAL ARRANGEMENT OF ENTRIES

The entries in the *Merit Students Encyclopedia* are arranged in a simple alphabetical order. The method of arrangement combines elements of the system used in most dictionaries with that used in telephone directories. Each entry begins with a heading in dark type. Some of these headings contain a comma; others do not. The basic principles of arrangement are listed below, including rules for placement of identical headings.

The alphabetical sequence is letter by letter.

air conditioning aircraft aircraft carrier aircraft landing system airedale terrier airfoil

When headings contain words out of their usual order, a comma is used to indicate the change of order, as in

Alaska, University of Alba, Duke of Alger, Horatio

Such entry headings are arranged in alphabetical sequence only up to the comma.

Bryansk Bryant, William Cullen Bryant College

When words preceding a comma are the same in two or more consecutive entries, the order is determined by the arrangement of the letters following the comma.

> Brooks, Phillips Brooks, Van Wyck

When two or more entries have the same heading, the entries are placed in the following order: persons, places, things.

Hannibal	Hercules	Phoenix
(person)	(person)	(place)
Hannibal	Hercules	phoenix
(place)	(constellation)	(bird)

Ž,

Rulers with identical names are listed alphabetically by the name of the territory ruled. Rulers with the same name and same realm are listed according to dates of reign.

Frederick IX (of Denmark)
Frederick I (of Holy Roman Empire)
Frederick II (of Holy Roman Empire)
Frederick II (of Prussia)

Popes are listed by dates of reign, and they precede rulers of the same name.

Paul VI (Pope)
Paul I (Emperor of Russia)

Other persons with identical names are listed according to date of birth.

Butler, Samuel (born 1612) Butler, Samuel (born 1835)

Places with identical names are listed according to the importance of the political unit, in descending order.

> New Brunswick (Canadian province) New Brunswick (U.S. city)

When places of the same political unit have identical names, they are arranged alphabetically by location. Cities in the United States and Canada are always located in reference to states or provinces. Cities elsewhere are usually located in reference to countries

Abilene (Kansas) Abydos (Egypt)
Abilene (Texas) Abydos (Turkey)

Things with identical names are arranged alphabetically according to the subject in which they are classified.

aberration, in astronomy aberration, in optics

GUIDE TO PRONUNCIATION

Pronunciations in *Merit Students Encyclopedia* appear in parentheses following entry headings. Heavy and light stress marks are used after syllables to indicate primary and secondary accents. A heavy stress mark is used in words that contain one primary accent, such as **comet** (kom'it). Both heavy and light stress marks are used in words that have secondary as well as primary accents, as in **communication** (kə mū' nə ka'-shən). When two or more entries have exactly the same pronunciation, as with Paris the mythological hero and Paris the French city, the pronunciation is given only with the entry that appears first. Where possible, letters of the standard alphabet are used as symbols in the pronunciation system in preference to less familiar symbols. The symbols used are shown below with some words in which their sounds appear.

a ā ā a b	hat, cap age, face care, air father, far	j k l m n	jam, enjoy kind, seek land, coal me, am no, in long, bring	и й ü ū	cup, butter full, put rule, move use, music
ch d	child, much did, red	o ō ô	hot, rock open, go order, all	w y	very, save will, woman young, yet
e ē ėr	let, best equal, see term, learn	oi ou	oil, voice house, out	z zh	zero, breeze measure, seizure
f g h	fat, if go, bag he, how	p r s sh t	paper, cup run, try say, yes she, rush tell, it		represents: in about in taken in April
$\frac{\mathrm{i}}{\mathrm{i}}$	it, pin ice, five	th ŦH	thin, both then, smooth	o u	in lemon in circus

In pronunciations for entries describing foreign persons and places it is sometimes necessary to represent sounds that are not used in English. Such foreign sounds are represented by four special symbols, which are listed below. Each symbol is accompanied by a brief indication of how the sound it represents is produced.

- Y as in French du. Pronounce $\overline{\mathbf{e}}$ with the lips rounded as for English $\ddot{\mathbf{u}}$ in rule.
- ce as in French peu. Pronounce \bar{a} with the lips rounded as for \bar{o} .
- N as in French bon. The N is not pronounced but shows that the vowel before it is nasal.
- H as in German ach. Pronounce k without closing the breath passage.

MASS to MUSES

mass (mas), one of the fundamental properties of matter. It is usually used as a measure of the quantity of material in an object. Mass is not the same as weight. The weight of an object is the force of attraction exerted on the object by gravitation. An object weighing one pound on the earth would weigh only a few ounces on the moon, which has a weaker gravitational pull, but its mass would not change.

There are two types of mass: inertial and gravitational. Inertial mass is the quantity of inertia that an object has. Inertia is a measure of the object's resistance to motion or to a change in motion. A massive object is harder to start moving than a less massive one, and it is also harder to stop once it is moving. Gravitational mass is the amount by which an object attracts, and is attracted by, other objects due to gravitation. Albert Einstein demonstrated that inertial mass and gravitational mass are equivalent.

The fact that two bodies of different masses fall to the ground at the same rate in a vacuum is due to the equivalence of inertial and gravitational mass. The object of greater mass is pulled more strongly but offers more inertial resistance.

Einstein also showed that mass and energy are equivalent and are related by the equation $E=mc^2$, where E represents energy, m mass, and c the velocity of light in a vacuum. This means that mass can be converted into energy and also that energy can be converted into mass. *Lyman Mower

Mass, the Eucharistic service, the main act of worship in the Roman Catholic Church. Catholics are required to attend Mass on Sundays and specific Holy Days, and daily attendance is encouraged.

In Catholic belief the Mass is a sacrifice, which repeats in a bloodless manner the same sacrifice that Christ made on the Cross for mankind. It is believed that Christ is physically present on the altar under the appearance of bread and wine and that He again offers Himself to God with the human priest as His agent. The Mass is offered to give adoration to God, to atone for the sins of mankind, to thank God for His blessings, and to petition for additional blessings.

The Mass, which is celebrated for the people by a priest, consists basically of three parts. In the Offertory the bread and wine are offered up to God. In the Consecration, Catholics believe the bread and wine are transformed into the Eucharist, or body and blood of Christ. Finally, the priest consumes the Eucharist in the Communion ceremony. Many worshipers partake of the Eucharist, or Holy Communion. There are also formal prayers and Gospel and Epistle readings.



MARYKNOLL FATHERS/MONKMEYER

During the Consecration of the Mass the priest elevates the host and then the cup in offering and adoration. Traditionally the priest faced the wall, but in recent usage he faces the people.

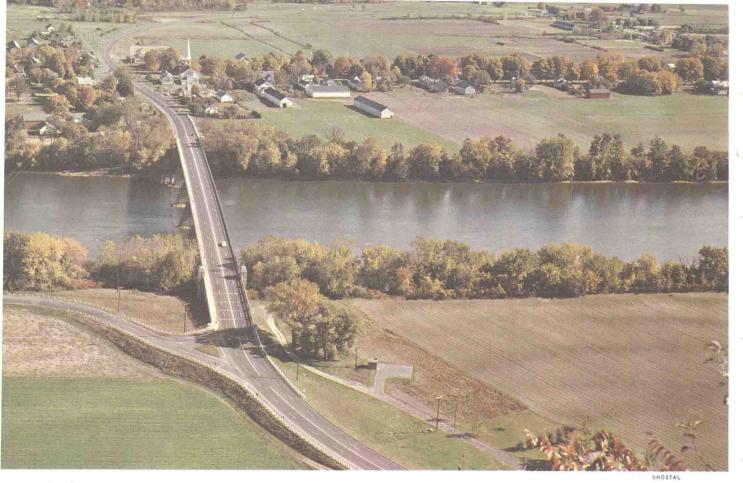
The type of Mass offered varies with the occasion, although its basic form remains the same. A Pontifical Mass is said by a cardinal or other high Church dignitary. A Solemn High Mass is one in which the prayers are sung by priest and choir, while in a Low Mass the prayers are spoken. The prayers of the Mass have long been said in Latin, but in recent years the Holy See has granted permission for the use of other languages. Orthodox Eastern Christians call the Mass the Holy Liturgy.

*Rev. Thomas H. McBrien, O.P.

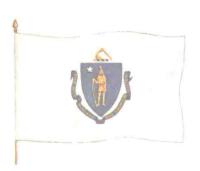
mass, center of. See CENTER OF MASS.

Massachuset Indians (masəchü'sit), a North American tribe or confederation that lived in eastern Massachusetts, including the present site of Boston. They spoke an Algonquian language. They hunted, fished, and farmed, and corn was their staple food. Their clothing, which was made of animal skins, consisted of leggings for the men and blouses and tunics and skirts for the women. They lived in wigwams.

In the 1600's, epidemics and Indian wars reduced the 3,000 Massachuset to about 500. Most were converted to Christianity by the missionary John Eliot and lost their tribal identity when they went to live in the six Praying Indian villages that Eliot founded. See also Indians, American. *Frederick J. Dockstader



A white village steeple rises on the bank of the Connecticut River, which flows from north to south through western Massachusetts.



MASSACHUSETTS

Area. 8,257 square miles (21,386 sq km), including 431 square miles (1,116 sq km) of inland water; rank: 45th largest state
Population. (1970) 5,689,170; rank: 10th largest state

(est. 1977) 5,782,000; change (1970–1977) +1.6 percent

Largest City. Boston; pop. (1970) 641,071

Statehood. Feb. 6, 1788; 6th state to ratify the Constitution

Government. State capital: Boston. State constitution adopted 1780. Representation in Congress: 2 Senators; 12 Representatives. Number of electoral votes: 14. Number of counties: 14

State Flag. Adopted 1908. The state coat of arms is centered on a white field.

State Song. All Hail to Massachusetts

State Motto. Ense petit placidam sub libertate quietem ("By the sword we seek peace, but peace only under liberty.")

State Nicknames. Bay State; Puritan State; Baked Bean State; Old Colony State

State Tree. American elm

State Bird. Chickadee

State Flower. Mayflower



Massachusetts (mas'ə chü'sits), one of the states of New England. It is bounded by the Atlantic Ocean on the east and southeast, Rhode Island and Connecticut on the south, and New York on the west. North of Massachusetts lie Vermont and New Hampshire. Massachusetts is commonly called the Bay State or the Old Bay State, but it is also known as the Baked Bean State, the Old Colony State, and the Puritan State. Its role in colonial history and in the American Revolution can be seen in the many well-preserved landmarks in such historic places as Plymouth, Boston, Lexington, and Concord. From its long irregular shoreline to the rolling Berkshire Hills the state offers a variety of opportunities to those seeking recreation.

Once the nation's fishing and commercial capital, the Bay State later pioneered in the fields of education and social welfare. In the 20th century, Massachusetts has become a leading technical research center as well as an outstanding manufacturing state.

Physical Geography

Massachusetts, the sixth smallest state in the nation, covers 8,257 square miles (21,386 sq km), including 424 square miles (1,010 sq km) of inland water. It is roughly rectangular in shape, except for the peninsula of Cape Cod, which extends from the southeastern part of the state. The state has an average breadth from east to west of about 145 miles (232 km). Cape Cod extends east from the mainland another 65 miles (105 km). From north to south the distance ranges between about 47 and 90 miles (75–144 km).

Natural Regions. All of Massachusetts was once covered by glaciers. These glaciers rounded off mountains, changed the course of streams, and left hundreds of ponds and lakes. Glacial deposits in the form of clay, stones, and boulders cover most of the state.

Within Massachusetts are two natural regions, or physiographic provinces, of the United States. Most of the state belongs to the New England province, which in turn is part of the much larger Appalachian Region. In Massachusetts the New England province is subdivided into the Taconic section, the Green Mountains, the New England Upland, the Connecticut Valley Lowland, and the Seaboard Lowland. Massachusetts' second natural region is part of eastern North America's Coastal Plain and is called the Atlantic Coastal Plain. Only a small piece of its Embayed section appears in the state.

The Taconic section, sometimes called the Taconic Hills or Taconic Mountains, occupies the extreme western part of the state and is one of its most rugged sections. The Taconics have an average height of about 2,000 feet (600 meters). The mountains extend generally from northeast to southwest, with narrow valleys between. The Taconic section also includes the Berkshire Valley, a narrow, generally level valley just east of the highlands. Mount Greylock (3,491 feet; 1,064 meters), in the Taconic section, is the highest peak in the state.

The southern part of the Green Mountains extends into Massachusetts, where they are most commonly referred to as the Berkshire Hills. They are also sometimes called the Hoosac Range. These highlands make up a small region that is about 25 miles (40 km) wide in the northwestern part of the state, east of the Taconic section. The mountains are heavily forested and reach a height of about 2,500 feet (750 meters).

Student's Guide

This article is organized under the following major headings.

PHYSICAL GEOGRAPHY, including natural regions, rivers and lakes, coastline, climate, soils, forests and plant life, animal life, and conservation ECONOMIC ACTIVITIES

THE PEOPLE OF MASSACHUSETTS, including population distribution, cities, and population composition

EDUCATION AND CULTURAL LIFE RECREATION AND PLACES TO VISIT GOVERNMENT

HISTORY

FAMOUS BAY STATERS

The leading cities and other important places in Massachusetts are the subjects of separate articles.



The New England Upland lies to the east of the Taconic section and the Berkshire Hills. The region is mostly hilly, with an average elevation of about 1,000 feet (300 meters). The upland generally slopes downward very gradually to the east. Throughout the upland rise occasional monadnocks, or isolated mountains. The Connecticut Valley Lowland cuts across the west-central part of the region. This river valley is from 5 to 20 miles (8–32 km) wide, and in Massachusetts it is generally level.

The Seaboard Lowland makes up most of the eastern third of the state. This region is a level or gently rolling section that rises gradually to a height of 500 feet (150 meters) in the east-central part of the state. The Seaboard Lowland has many ponds, swamps, and small rivers. There are a few rather low monadnocks throughout this region. In addition, small hills, called drumlins, which were formed by the glaciers, are found throughout the region.

The Embayed section of the Atlantic Coastal Plain in Massachusetts includes Cape Cod, the islands of Martha's Vineyard and Nantucket, the Elizabeth Islands, and other smaller islands. This section is mostly level or rolling, although some hills formed by the glaciers rise to 300 feet (90 meters). Sand dunes, ponds, and marshes are common in this region.

Rivers and Lakes. There are more than 4,200 miles (6,700 km) of rivers in Massachusetts. The largest river in the state is the Connecticut, which flows for about 100 miles (160 km) from north to south across

4 Massachusetts



the west-central part of the state. The main tributaries of the Connecticut in the state are the Deerfield, West-field, Millers, and Chicopee rivers.

The Merrimack River, in the northeast, is Massachusetts' second largest river. It enters the state from New Hampshire northwest of Lowell and flows through Massachusetts for about 35 miles (56 km) before emptying into the Atlantic at Newburyport. The main tributary of the Merrimack in Massachusetts is the Concord. Other smaller rivers in the state are the Housatonic, Blackstone, and Charles.

There are more than 1,100 lakes and ponds in Massachusetts. By far the largest is Quabbin Reservoir, in the central part of the state, with an area of more than 38 square miles (100 sq km). Other large artificial lakes include Wachusett Reservoir, East Brimfield Reservoir, and Cobble Mountain Reservoir. Assawompsett Pond, covering about 4 square miles (10 sq km), is the largest natural lake. North Watuppa

Pond, Long Pond, and Lake Chaubunagungamaug (Webster Lake) are other large natural lakes.

Coastline. The state's coast is about 192 miles (307 km) long. The coastline is very irregular, however, and if all the small bays and islands are taken into account, its total length is about 2,000 miles (3,200 km). The largest bays are Massachusetts Bay; Cape Cod Bay; and Buzzards Bay, an inlet west of Cape Cod that is connected to Cape Cod Bay by a canal.

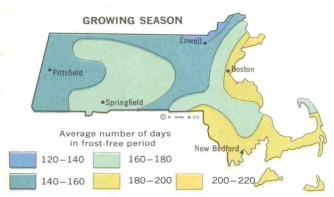
Many islands lie off the Massachusetts coast. The largest are Martha's Vineyard, a triangular-shaped island 5 miles (8 km) southwest of Cape Cod and covering about 100 square miles (260 sq km), and Nantucket Island, 25 miles (40 km) south of Cape Cod and measuring about 50 square miles (130 sq km). Other islands belong to the Elizabeth Islands, also southwest of Cape Cod. Many small islands, which are the tops of drumlins, are found in Boston Bay. The Massachusetts coast has many fine harbors. The largest is Boston harbor. Other harbors include those of Gloucester, Plymouth, and New Bedford.

Climate. Massachusetts has a humid continental climate, with long hot summers and cold winters. The coastal areas tend to be milder than the interior and have somewhat higher humidity. Most of Massachusetts has average summer temperatures of from 68° F. (20° C.) to 72° F. (22° C.), although daytime temperatures may sometimes exceed 90° F. (32° C.). Average January temperatures vary from 22° F. (-6° C.) in the Berkshires to 32° F. (0° C.) along the southeastern coast. Winter temperatures below 0° F. (-18° C.) are fairly common in the interior.

Precipitation is evenly distributed throughout the year. Most parts of Massachusetts receive from 40 to 46 inches (1,000–1,170 mm) a year, and severe

Gloucester, on Cape Ann, is a busy fishing center that attracts many tourists. The city's principal industry is fish processing.





droughts are uncommon. Heavy snowfalls are common throughout most of the state, especially in the western highlands. However, the snowfall is relatively light on Cape Cod and the offshore islands.

The growing season, or period from the last killing frost in spring to the first killing frost in fall, is about 160 days in the eastern and central parts of the state. The longest growing season is on the coast, and just north of Boston it is about 200 days.

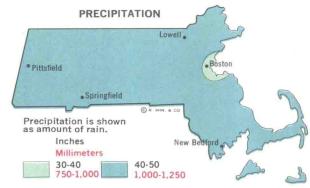
Soils. The soils of Massachusetts are mostly brown podzolic soils. They tend to be infertile, although many of them can be made productive by the use of fertilizers. Some river valleys, especially the Connecticut river valley, have rich alluvial soils. Much of Cape Cod has sandy soils that support extensive cranberry cultivation in bogs but are otherwise poor for farming. The mountainous areas have mostly infertile podzolic soils. Most of the soils in the state are generally stony because of glacial deposits.

Forests and Plant Life. Originally almost all of Massachusetts was covered with forests. At present about 70 percent of it is forested, but only a very small part of this area is forest that has never been cut. Almost 90 percent of the forest land is privately owned. Mixed forests of broadleaf deciduous trees, such as the beech, birch, and maple, predominate throughout most of the state. Other common trees are the cherry, hickory, red cedar, oak, and butternut. Evergreen forests of white pines, hemlocks, and spruces are found mainly in the higher elevations, but some evergreens may be found scattered throughout the broadleaf forest. Pitch pines and scrub oaks are found in the southeastern part of the state. The elm, Massachusetts' state tree, is a common shade tree in many towns.

The forest floor in Massachusetts contains ferns, such as asmundas and maidenhair spleenworts. Areas near the sea have marsh grasses, sedges, and rushes. Marshy areas have such plants as the skunk cabbage, marsh marigold, white violet, and blue violet. Flowering shrubs on the forest floor or in open areas include the dogwood, azalea, rhodora, sweet fern, mountain laurel, wild cherry, and trailing arbutus, or mayflower, which is the state flower. Wild flowers include the violet, bloodroot, and goldenrod.

Animal Life. The most common large animal found in Massachusetts is the deer. Black bears are occasionally seen in the western part of the state. Foxes, raccoons, weasels, skunks, woodchucks, muskrats, mice, squirrels, chipmunks, and rabbits are fairly common. There are also bats, shrews, and moles.

The chickadee, the state bird, and the robin are among the most common birds in Massachusetts. Gulls and terns are found along the coast. Birds found in



the broadleaf forests are woodpeckers, flycatchers, warblers, scarlet tanagers, hawks, and owls. The bob-white, phoebe, bobolink, eastern meadowlark, and sparrow live in the farmland. Loons, grebe, and ducks are particularly numerous in the winter.

Fish commonly found in the rivers and ponds of Massachusetts include trout, bass, pickerel, and perch. Saltwater fish and shellfish include flounder, haddock, cod, smelt, striped bass, clams, scallops, and lobsters.

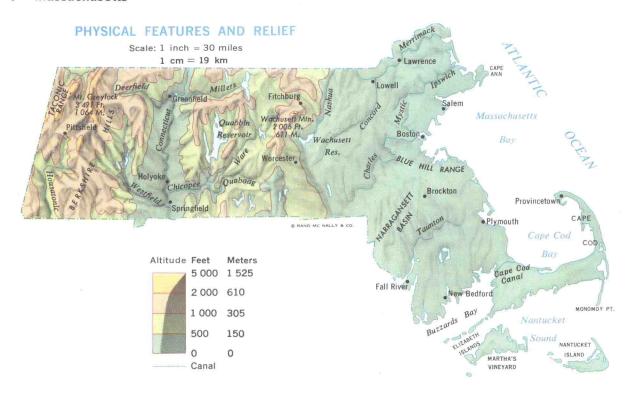
Conservation. The main conservation programs of Massachusetts include the protection of forested areas, the preservation of wildlife, and the development of a pure water supply. State legislation has also restricted thermal and air pollution. The state agencies active in conservation include the division of forests and parks, the division of fisheries and game, and the division of water resources. Federal agencies that are active in Massachusetts conservation include the National Park Service, which manages Cape Cod National Seashore; the Forest Service; and the Fish and Wildlife Service, which maintains three national wildlife refuges and also the Biological Research Laboratory at Woods Hole to study fish and fish by-products. The Woods Hole Oceanographic Institution is also concerned with marine research.

Massachusetts' main conservation problem is the pollution of many of its rivers and streams. Although some sewage treatment plants have been built and a few restrictions on the discharge of industrial wastes have been enacted, the larger rivers of Massachusetts, especially the Merrimack and the Connecticut, are severely polluted. Nevertheless, a huge supply of water for use by the cities has been assured by the building of large reservoirs throughout the state.

Economic Activities

Massachusetts, which has always shared in the industrial growth of the United States, has become primarily a manufacturing state. Manufacturing provides more income than any other activity in the state and employed 26 percent of the labor force in 1976. The primary economic activities are not of great importance to Massachusetts. Agriculture, forestry, fisheries, and mining together account for only about one percent of the labor force. Like workers elsewhere, those in Massachusetts are turning in growing numbers to jobs in the service industries, in finance and insurance, and in government. Employment in wholesale and retail trade has also mushroomed since World War II. A major reason for the growth in service jobs has been the increased importance of tourism.

A special feature of the state's labor force is its high proportion of professionally trained people, in-



cluding engineers, scientists, and technicians. Its labor force has helped Massachusetts turn to highly technical kinds of manufacturing, thereby compensating for its severe losses in textile employment.

Agriculture. Most farms in Massachusetts are small and are family owned and operated. The average farm, about 125 acres (50 hectares), has been growing larger as small holdings have been consolidated. Total farmland has steadily shrunk. Woods have reclaimed much of the abandoned acreage, and the spread of towns and industry has devoured other farms. Rural properties are also in demand for vacation retreats.

Cranberries are harvested from a bog on Cape Cod. The area around Cape Cod specializes in growing cranberries.



Agricultural specialties are the hallmark of Massachusetts agriculture: dairy products, poultry products, vegetables, tobacco, apples, and, most famous of all, cranberries. Oats and especially hay are widely grown in conjunction with dairying. Although dairying is found throughout Massachusetts, the highest concentration of dairy farms is in the northwest. Poultry farming, by contrast, tends to be concentrated in the eastern counties in the Seaboard Lowland. Horticulture—the growing of plants and shrubs for landscaping, and of flowers for the wholesale market—ranks with dairying and truck farming as the state's most valuable agricultural activities.

Mining. Most of the mineral production in Massachusetts consists of sand, gravel, and stone. These minerals are extracted in most parts of the state. Some limestone and marble is quarried in the Berkshires. Clay, used mainly for brick and tile, is found in Bristol, Hampden, and Plymouth counties. Fine pottery clays exist on Martha's Vineyard and around Andover. Peat, used largely for fertilizer, is also found in the state.

Fishing. Massachusetts is a leading state in the processing of frozen fish and ranks fifth in the nation in the value of its catch. Fishermen work both the nearby coastal waters and more distant fishing banks, including the Grand Banks of Newfoundland and Georges Bank off Cape Cod. Gloucester leads the state in the quantity of its seafood catch (mostly cod, haddock, sea herring, and whiting). New Bedford, which leads the state in the value of its catch, also leads the nation in flounder and sea scallops. Boston, which specializes in haddock and cod, is the state's third most important fishing port.

Forestry. Massachusetts has about a tenth of the commercial forest land in New England but harvests less timber than Maine, New Hampshire, or Vermont. Its modest forest industry cuts mainly white pines, spruces, oaks, maples, and birches. The wood is used for pulp, posts, piling, toys, furniture, and boxes.

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Power. Hydroelectricity is generated, chiefly on the Connecticut River and its tributaries in the western part of the state. However, hydroelectric power accounts for only about 16 percent of the state's generating capacity. Most power is supplied by steam generators using either coal or petroleum. The state's first nuclear-powered generator went into operation in 1960 at Rowe, in the northwestern part of the state. A second nuclear plant began operating at Plymouth in 1972.

Manufacturing. The state's manufactures have been greatly diversified since the early 19th century, when shoes and textiles were dominant in the economy. During the 20th century the producers of these goods moved most of their operations to states where laborers could be recruited for lower wages. High-quality finished metal products now occupy the place vacated by these soft goods. Defense and the space age increased research and manufacturing in the areas of electronics, instruments, and atomic energy. The industries producing transportation equipment and non-electrical and electrical machinery have also grown in importance since World War II.

Massachusetts is the leading wholesale wool center in the nation. The state is still a leader in the leather industry, but the importation of foreign footwear has forced many shoe factories to close. The apparel industry is also important to the state's economy.

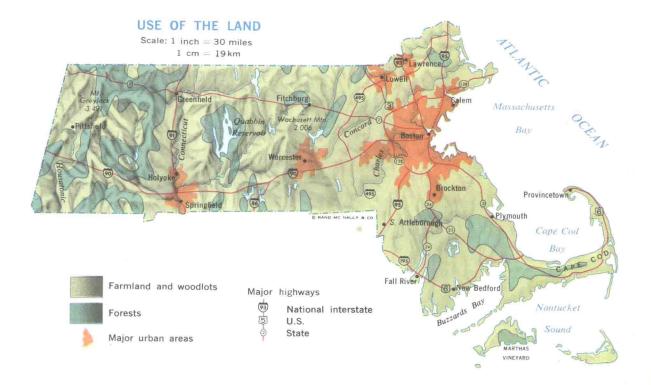
The nonelectrical machinery industry is the leading source of manufacturing income in the state. Its products include office and computing machinery; aircraft engines; steam generators; and printing-trade, textile, and other industrial machinery. Second in importance is the manufacture of electrical equipment, including communications equipment; radio and television receiving equipment and components, especially tubes; electrical appliances; lighting fixtures; power transmission equipment; and computers and other office ma-

FARM PRODUCTION, 1976

Commodity	Quantity Produced	Sales
Crops		\$100,560,000
Greenhouse and nursery products		38,392,000
Vegetables		22,021,000
Cranberries	935,000 barrels	12,155,000
Tobacco	920 short tons	11,236,000
Apples	44,500 short tons	10,502,000
Livestock and Produc	\$114,163,000	
Milk and cream	299,000 short tons	65,882,000
Eggs	36,833,300 dozen	26,578,000
Cattle and calves	12,500 short tons	8,283,000
Hogs	8,500 short tons	7,297,000
Total, including item	s	\$214,723,000

chines. Related to these industries are the manufacture of instruments, optical goods, and watches and of fabricated metal products, including machine tools, bolts, screws, brass and bronze castings, cutlery, aluminum windows, fans, and hardware. Many of these products are intended for military purposes.

Among the older industries of the state that have continued to prosper are printing and publishing and paper manufacturing. In 1639 the first printing press in the colonies was brought by Stephen Daye to Cambridge, where he founded the Cambridge Press. A number of publishers of books and of magazines and newspapers are located in Massachusetts. Publishing is one of the leading industries in the Boston area. There is substantial commercial printing and such specialty work as bookbinding. The state also produces greeting cards and high-quality special papers. For example, the paper used in U.S. currency is manufactured in the town of Dalton.





An electronics laboratory near Boston. Proximity to university research centers attracts electronics firms to this area.

Another major industry in the state is food processing, including candy making and the processing of fish, cranberries, gelatin, and sugar. The rubber and

MINERAL PRODUCTION, 1976

Mineral	Quantity	Value
Stone	7,937,000 short tons	\$33,502,000
Sand and gravel	16,084,000 short tons	29,666,000
Other minerals ¹		6,682,000
Total		\$69,850,000

¹ Mostly lime, but includes clays and other nonmetals.

MANUFACTURING STATISTICS, 1976

Industry Group	Value Added*	Number of Employees
Nonelectrical machinery	\$2,619,500,000	76,700
Electrical equipment	1,842,300,000	78,900
Instruments	1,345,200,000	41,500
Fabricated metals	1,118,600,000	43,100
Printing & publishing	1,021,700,000	40,500
Food products	768,800,000	28,500
Paper products	708,900,000	28,500
Rubber & plastic products	686,100,000	29,800
Transportation equipment	668,800,000	21,800
Chemicals	650,300,000	15,100
Clothing	572,700,000	41,300
Textiles	514,000,000	24,500
Stone, clay, & glass products	351,500,000	12,300
Leather products	344,200,000	20,300
Primary metals	318,600,000	10,100
Furniture & fixtures	155,300,000	8,400
Lumber & wood products	88,200,000	5,000
Total, including units not listed above	\$14,420,600	590,900

^{*} The "value added" by an industry is a measure of its contribution to income. Value added is equal to the sum of wages, rents, and profits. It is calculated by subtracting from the sales price of the goods such production costs as raw materials and power (but not labor).

plastics industry and the transportation equipment industry are also important.

Although manufacturing is scattered throughout the state, it is especially prominent in certain areas. One is the Greater Boston area, which accounts for almost half the state's total income from industry. The Greater Boston area is large, taking in such communities as Cambridge, Quincy, Needham, Newton, Framingham, Lynn, Waltham, Norwood, Somerville, Peabody, and Salem. The Boston area is a famous wool market and is also noted for leather products. It has a sizable proportion of the state's printing and publishing. Boston is also the center for food processing, shipbuilding, and the manufacture of transportation equipment and nonelectrical machinery. The area accounts as well for about one-third of New England's electronics manufacturing.

Inland, industry has traditionally located in the river valleys to take advantage of both waterpower and natural transportation routes. The Connecticut Valley cities of Springfield, Holyoke, and Chicopee make up the second most important manufacturing region. Springfield's products include firearms, valves, chemicals, sporting goods, plastics, and rubber tires. Holyoke has remained a textile and paper town but also produces machinery. Nearby Chicopee makes rubber tires, sporting goods, electronics equipment, and machinery. The industrial cities of Pittsfield and North Adams, on the Housatonic River in the northwestern part of the state, have attracted several electrical machinery manufacturers, including electronics concerns.

Until recent years the Merrimack Valley cities of Lawrence and Lowell were almost exclusively engaged in manufacturing cotton and wool textiles. As the textile industry has contracted, electronics and communications plants have moved in. Also part of the Merrimack Valley complex is Haverhill, which has specialized in shoe manufacturing.

The manufacturing region that ranks third in income generated by industry is Worcester. It processes metals and manufactures industrial machinery, machine tools, abrasives, paper, and textiles. In the same vicinity are Gardner, which manufactures furniture, and Leominster, a leading plastics center.

Industrial concentration is also prominent in the southeastern part of the state in the formerly great textile manufacturing cities of Fall River and New Bedford. Among Massachusetts' oldest cities, these textile centers experienced heavy unemployment and population losses as the textile industry declined. However, the apparel industry and rubber-goods plants in Fall River have helped somewhat to bridge the employment gap caused by the exodus of textile concerns.

Transportation and Commerce. There are 1,500 miles (2,400 km) of railroad in Massachusetts. The Massachusetts Bay Transportation Authority, a public agency subsidized by the state, provides commuter service for communities in the Boston area. The state has a fine network of roads and highways. The Massachusetts Turnpike, part of National Interstate Highway 90, is a limited-access toll highway running west from Boston through Palmer and Lee to the New York state line, where it connects with the Governor Thomas E. Dewey Thruway. Another major artery is Route 128, which swings in a wide arc around Greater Boston, intersecting the north-south express routes National Interstate highways 93 and 95, as well as the Massa-

chusetts Turnpike. Other major arteries are Interstate 91, which runs directly north through Springfield, and Interstate 495, which forms a north-south arc to the west of the Boston area. By 1976 the state had more than 32,800 miles (52,800 km) of municipal and rural roads. Of this total, 419 miles (674 km) were included in the national system of interstate highways.

By 1976 Massachusetts had 139 airports. Logan International Airport in Boston is one of the leading U.S. airports. There is also commercial air service to Worcester, New Bedford, Hyannis and Provincetown on Cape Cod, Martha's Vineyard, and Nantucket Island.

Nantucket Island and Martha's Vineyard are also served by ferries, which carry cars as well as passengers to and from Woods Hole. The only functioning inland waterway in the state is the Cape Cod Canal, a federally owned sea-level waterway that traverses the neck of Cape Cod from Sandwich to Bourne, a distance of about 8 miles (13 km). Part of the Intracoastal Waterway, the canal handles oceangoing ships and considerably shortens the water route between New England and the Middle Atlantic States.

Although several coastal cities are important fishing ports, Boston's harbor is by far the most commercially important in the state and ranks as a leading Atlantic port. The city's commerce consists mainly of inbound cargo. Major inbound cargoes are petroleum, sugar, salt, gypsum, and iron and steel products.

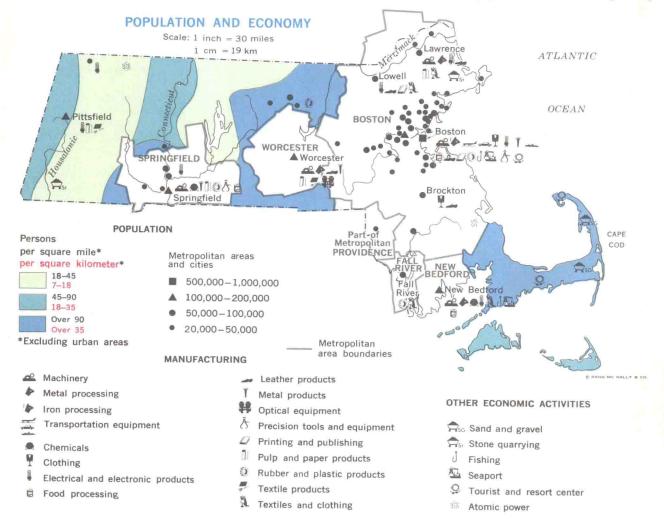
The People of Massachusetts

In 1970 the population of Massachusetts was 5,689,170, placing it 10th among the 50 states. This figure had increased from 1960 to 1970 by 10.5 percent, slightly less than the rate for the United States as a whole. Between 1950 and 1960 the state's population had increased by 9.8 percent.

Population Distribution. Massachusetts lies on the northern end of the continuous urban belt that is sometimes referred to as Megalopolis. The state's population density of 735 persons per square mile (266 per sq km) in 1970 was higher than that of any other state except Rhode Island and New Jersey. Roughly 85 percent of its inhabitants are urban dwellers.

Massachusetts had more urban than rural inhabitants as far back as 1850 and had become overwhelmingly urban by 1930. Since World War II the movement from urban to suburban areas has made the distinction between rural and urban areas somewhat less clear, and most of the persons classified as rural dwellers do not live on farms. Such central cities as Boston and Worcester have lost residents to their outlying areas, and such textile cities as Fall River and New Bedford have also lost population.

Since 1940 the fastest-growing county has been Barnstable County, which takes in all of Cape Cod. It has almost doubled in population. The fastest-growing





The City Hall in Boston is one of several modern structures in the city's government center. In the foreground is a sculpture by the artist Dimitri Hadzi.

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cities have been Beverly, Peabody, Revere, and Woburn, in the Boston area; Marlboro, west of Boston; Chicopee and Westfield, in the Springfield area; and Leominster, in north-central Massachusetts. Many smaller towns on the suburban fringes of the core cities have doubled or quadrupled in population.

Cities. Massachusetts' capital and largest city is Boston. There are 78 towns and cities in all belonging to the Boston metropolitan area, which in 1970 had a population of 2,753,700 and took in almost half the state's entire population. The central city of Boston had 641,071 inhabitants in 1970.

Next in size to Boston is the metropolitan area of Springfield-Chicopee-Holyoke, which in 1970 contained 529,922 people. Springfield alone had 163,905 people. Third came Worcester, with 176,572 in its central city and 344,310 people in the metropolitan area. Among the other large urban centers in Massachusetts are New Bedford, Fall River, Lowell, and Lawrence.

Several cities have turned to urban renewal in order to arrest deterioration in their downtown areas. Boston, Worcester, and Springfield have built new cultural, shopping, and government centers.

Population Composition. The state is noted for a rich diversity in the national background of its residents. Although the earliest settlers were English, people of many countries subsequently made their home in Massachusetts. In the 1840's the potato famine drove many Irish to Massachusetts. After the Civil War the mills attracted many French Canadians, and about the turn of the century, Italians became a third major influx. The descendants of the English (Yankees), the Irish, and the Italians have dominated state politics in recent years. Massachusetts has a considerable proportion of foreign-born or first-generation citizens. Canadians, Russians, Poles, Lithuanians, Finns, Swedes, Portuguese, Greeks, Armenians, Czechs, Scots, and Welsh all have their separate neighborhoods and have all contributed to the state's economic and cultural progress. So also have blacks, who have lived in Massachusetts since colonial times. The black population is concentrated in Boston, where it makes up about 16 percent of the total.

In religious affiliation the state is about evenly split between Roman Catholicism and the various Protestant churches. The United Church of Christ (successor to the Congregational Church) is the largest of the Protestant groups in Massachusetts, although most other faiths are represented.

Education and Cultural Life

Massachusetts has long been a leader in the nation's educational development. America's first secondary school, the Boston Latin School, was founded in the colony in 1635. Harvard University, the oldest college in the United States, was chartered in 1636. After 1647 all towns with at least 50 families had to support a schoolmaster and all towns of at least 100 families had to have a school. This law was enacted to foil the "chiefe project of ye ould deluder, Satan, to keepe men from the knowledge of ye Scriptures." In 1834, Mary Lyon, an advocate of higher education for women equal to that offered men, helped organize Wheaton Female Seminary; it later became Wheaton College. Two years later she helped found Mount Holyoke Female Seminary, which grew into Mount Holyoke College.

One of Massachusetts' foremost educators was Horace Mann. In 1837 he persuaded the state to organize the Massachusetts board of education and became its first secretary. Under his leadership, teacher training was started two years later at the nation's first state normal school, at Lexington.

Educational Institutions. Education is compulsory for children from the age of 7 to 16. Most of the control of public education is vested in elected town and city school committees, but recent changes have given the state greater control. An 11-member board of education appointed by the governor determines policy. The board sets guidelines, and may, at its discretion, withhold state funds. The board appoints the state commissioner of education, who acts as its executive officer.

The state maintains the University of Massachusetts at Amherst, with a branch at Boston and a medical school at Worcester; 8 state colleges; Massachusetts College of Art; Massachusetts Maritime Academy, at Buzzards Bay; University of Lowell; Southeastern Massachusetts University; and 15 accredited two-year community colleges. A list of the principal accredited four-year colleges and universities in Massachusetts is provided in the accompanying table.

Libraries and Museums. Every Massachusetts community has free public library service. There are important collections in the Boston Public Library and the Boston Athenaeum; the American Antiquarian Society library, in Worcester; the Perkins School for the Blind braille library, in Watertown; and the Essex Institute library, in Salem. The Widener Memorial Li-

PRINCIPAL COLLEGES AND UNIVERSITIES

Name	Location	Name	Location
American International College	Springfield	Massachusetts College of Art	Boston
Amherst College	Amherst	Massachusetts Institute of Technology	(M.I.T.) Cambridge
Anna Maria College	Paxton	Massachusetts Maritime Academy	Buzzards Bay
Assumption College	Worcester	Merrimack College	North Andover
Atlantic Union College	South Lancaster	Mount Holyoke College	South Hadley
Babson College	Wellesley	New England Conservatory of Music	Boston
Bentley College	Waltham	Newton College (affiliated with Boston	College) Newton
Boston College	Chestnut Hill	Nichols College	Dudley
Boston Conservatory of Music	Boston	North Adams State College	North Adams
Boston State College	Boston	Northeastern University	Boston
Boston University	Boston	Our Lady of the Elms, College of	Chicopee
Bradford College	Bradford	Radcliffe College	
Brandeis University	Waltham	(affiliated with Harvard University)	Cambridge
Bridgewater State College	Bridgewater	Regis College	Weston
Clark University	Worcester	Salem State College	Salem
Curry College	Milton	Simmons College	Boston
Eastern Nazarene College	Quincy	Smith College	Northampton
Emerson College	Boston	Southeastern Massachusetts	
Emmanuel College	Boston	University	North Dartmouth
Fitchburg State College	Fitchburg	Springfield College	Springfield
Framingham State College	Framingham	Stonehill College	North Easton
Gordon College	Wenham	Suffolk University	Boston
Hampshire College	Amherst	Tufts University	Medford
Harvard University	Cambridge	Wellesley College	Wellesley
Hebrew College	Brookline	Western New England College	Springfield
Holy Cross, College of the	Worcester	Westfield State College	Westfield
Jackson College (affiliated with Tufts Un	niversity) Medford	Wheaton College	Norton
Lesley College	Cambridge	Wheelock College	Boston
Lowell, University of	Lowell	Williams College	Williamstown
Massachusetts, University of	Amherst	Worcester Polytechnic Institute	Worcester
Massachusetts at Boston, University of	Boston	Worcester State College	Worcester

brary, at Harvard University, is the largest university library in the United States.

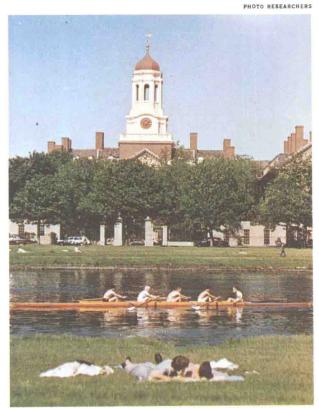
Massachusetts' leading museum is Boston's Museum of Fine Arts, where an outstanding collection of Oriental, Egyptian, Greek, Roman, European, and American art is housed. Fenway Court, the Isabella Stewart Gardner mansion in Boston, houses famous paintings. The Sterling and Francine Clark Art Institute, in Williamstown, has an important collection of European paintings of the 17th, 18th, and 19th centuries. Worcester's Art Museum is also well known.

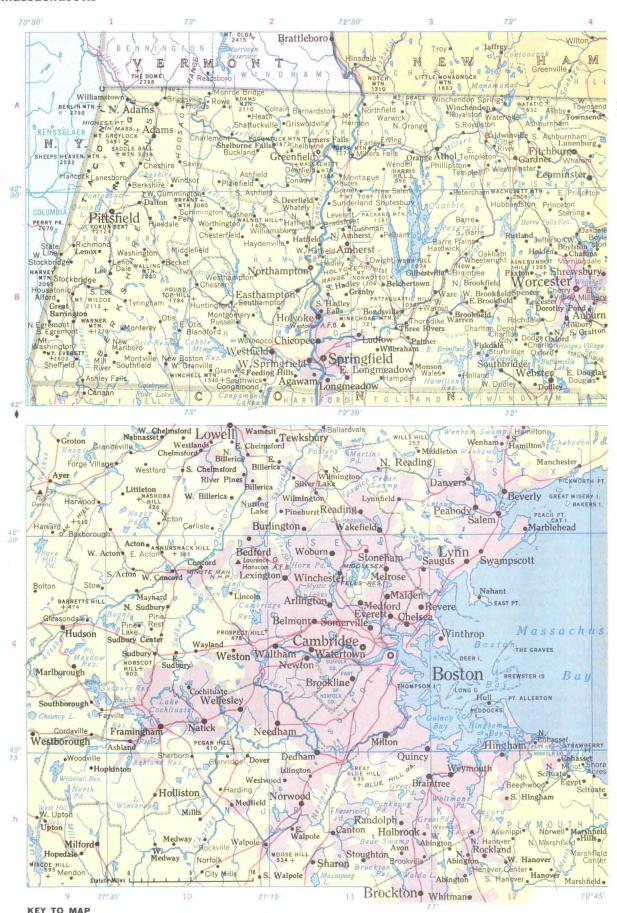
Of particular interest to young people are the Museum of Science, in Boston; the maritime collections at the Peabody Museum, in Salem; and two whaling museums, one at New Bedford and the other at Nantucket. The Boston-based Society for the Preservation of New England Antiquities maintains historic homes throughout the state.

Writers and Literary Movements. Since its founding, Massachusetts has been in the vanguard of American literature. Two of the earliest colonial histories were William Bradford's History of Plimoth Plantation and John Winthrop's Journal, which was later edited and published as The History of New England From 1630 to 1649. The published works of the three Mathers, Richard, Increase, and Cotton, provide many insights into the nature and outlook of the Puritan theocracy and its eventual decline. The fires of revolution were fanned by the pamphlets of Samuel Adams and James Otis, while the pen of John Adams provided a stabilizing influence. The Romantic poet William Cullen Bryant spent his early years in the state.

Before and after the Civil War there was a tremendous outpouring of literature from Massachusetts. The

The Charles River flows past Dunster House of Harvard University in Cambridge, Mass. The Boston metropolitan area is famous for its large number of institutions of higher learning.





Size of symbols and type indicates relative population.

 Major urban areas
 State capital Major railroads | + 5015 | Point of elevation (feet above sea level)