ENCYCLOPEDIA

AMERICANA

22

VOLUME 28

Venice to Wilmot, John

THE ENCYCLOPEDIA AMERICANA

INTERNATIONAL EDITION

COMPLETE IN THIRTY VOLUMES

FIRST PUBLISHED IN 1829

GROLIER INCORPORATED

International Headquarters: Danbury, Connecticut 06816

Library of Congress Cataloging in Publication Data
Main entry under title:

The Encyclopedia Americana—International Edition
p. cm.
"First published in 1829."
Includes bibliographical references and index.
ISBN 0-7172-0122-8
1. Encyclopedias and dictionaries. I. Grolier Incorporated.
AE5.E333 1991 90-23041
031—dc20 CIP

PRINTED AND MANUFACTURED IN THE U.S.A.

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Venice's Grand Canal sweeps by Santa Maria della Salute before entering the city to become its major waterway.

VENICE, ven'is. Sometimes called the Queen of the Adriatic, Venice has a physical site that few cities in the world can rival. The city proper is situated on more than 100 islands in a lagoon of the Adriatic Sea, 162 miles east of Milan. It is connected to the mainland by a 2.5-mile railroad bridge and a vehicular causeway of 228 arches built in 1932–1933. The central city is part of a unit of government called a commune that extends to the mainland and includes Porto Marghera and Mestre. The population of the commune is 360,293.

Plan of the City. Venice lies between the Alps on the northwest and the Adriatic on the southeast. Approximately in the center of a large lagoon, which comprises an area of about 180 square miles, are the muddy islands on which the first Venetians sank oak piles as foundations for their rude fisherman homes. On these small islands has arisen the almost magical city of Venice—its churches, palaces, and public buildings resting on piles buried beneath the lagoon's waters.

Along the borders of the islands are more than 100 canals. The Grand Canal, shaped roughly like a reversed letter S, over 2 miles long and varying in width from 33 to 77 yards, is the main artery, cutting the city into two unequal parts and connecting the railway station at the northwest with the open lagoon at the southeast. It is spanned by three bridges, of which the most notable is the Ponte di Rialto, a stone arch of the 16th century with small shops on each side, and connecting the central and oldest section of the city with the western quarter. From the Grand Canal extends an intricate network of smaller canals, averaging 4 to 5 yards in width, and measuring some 28 miles in total length. These lesser waterways are spanned by almost 400 bridges. On each of the tiny islands is a tortuous labyrinth of narrow, paved streets and lanes, some of which widen and join to form small, open squares. These narrow streets (*calli*) permit pedestrian travel, but much travel in Venice is by water, either in the *vaporetti* (little steamers) or *motoscafi* (motorboats) or by gondolas, which constitute one of the most distinctive features of Venetian life and which are so constructed as to permit passage through the narrowest canal. Barges propelled by men using long poles carry all the freight.

The largest square in Venice is the Piazza San Marco, one of the most beautiful squares in the world. Enclosed on three sides by the arcades of the Procuratie and on the fourth by the magnificent façade of St. Mark's Basilica, it is the center of the city's activities. At tables set outside the numerous cafés, citizens and visitors enjoy refreshments while listening to the lighthearted music of local bands. To the south of St. Mark's is a smaller square, the Piazzetta, with the Palazzo Ducale on the east and the Old Library on the west. The Piazzetta extends to the Canale di San Marco, and from this spot can be seen some of the outlying islands and, across the open lagoon, the Lido, one of the world's most famed bathing resorts. At the northeast corner of the Piazza di San Marco is a clock tower erected in 1496–1499, which serves as a portal to the Mercerie, a narrow, winding street of shops leading to the Rialto and the Grand Canal.

Proceeding along the Grand Canal, one passes Venice's most beautiful and most representative buildings. North and west of the Rialto, for instance, are the Fondaco dei Turchi, a 13th century example of Veneto-Byzantine architec-

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The misty view of San Giorgio Maggiore beyond the gondolas recalls the paintings of Canaletto and Guardi.

The nearly 400 bridges in this city of water are high enough for barges and gondolas to pass under them.

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ture, now largely restored; the 15th century Ca' d'Oro, a masterpiece of Venetian Gothic design; and the Palazzo Vendramin-Calergi, completed in 1509 and representative of the Lombardesque style of the early Renaissance (named for the Lombardo or Lombardi family). South and east of the Rialto are other palaces, representing every phase in the creative genius of Venetian architecture. Near St. Mark's the canal broadens into the lagoon surrounding Venice. The sections of this part of the city are bordered by a wide promenade and public gardens.

Of the islands not forming part of the main mass of the city the chief ones are (1) Giudecca, by far the largest, on the south, separated from Venice proper by the Canale della Giudecca; (2) San Giorgio Maggiore, immediately east of the former and separated from Venice by the broad Canale di San Marco, where the Teatro Verde, opened in 1954, is located; (3) San Pietro, east of the main island group; (4) San Michele, with the cemetery, to the north; (5) Murano, a group farther north, with an ancient glass industry; (6) Burano, to the northeast, famous for its laces; (7) Torcello, to the northeast, with an ancient Byzantine cathedral; and to the southeast, (8) San Servolo, with the province's insane asylum, and (9) San Lazzaro.

Historic Buildings and Other Points of Interest.—During the early period of Venetian art the city-state was closely associated with the Byzantine Empire. Thus techniques and forms of that culture were adapted by Venetian builders in their palaces, public buildings, and churches. By the 13th century, after Gothic design had begun to make itself felt, the Venetian palace was fully evolved. Venice, later than other cities in Italy, adopted by the 15th century some of the features of the early Renaissance, thus developing the Lombardesque Renaissance style.

Of many architecturally important structures in Venice the one most representative of the city's historic wealth and glory is St. Mark's

EUGENIO AIELLO/FPG

St. Mark's sumptuous Byzantine architecture recalls the past glory of Venice, when it linked east with west.

west, Venice struggled for, and achieved, independence as a republic. Her excellent position at the crossroads of East and West helped her to build up an empire in the Levant. She started her expansion in the 10th century by subduing pirates along the Dalmatian coast, thus gaining control of the Adriatic, then gradually secured trading and other privileges in a number of Mediterranean seaports. The city became one of the ports of embarkation for the Crusades. The growth of trade produced a merchant aristocracy which step by step gained ascendancy in state affairs. In 1172 the Grand Council of 480 members was established; the counselors to the doge formed the Council of the Invited (Pregadi), which became the forerunner of the Senate.

During the 13th and 14th centuries the possessions of Venice in the Levant continued to grow. In 1204 Doge Enrico Dandolo (q.v.) was a leader of the Fourth Crusade which conquered Constantinople, and the republic gained footholds in the Eastern Mediterranean, in the islands of the Ionian and Aegean seas, including Crete, and in seaports of Thessaly and other parts of the Greek mainland. Thus Venice had a long line of direct communication with Constantinople and the Levant. She ruled her colonies with skill, interfering little in local institutions and encouraging trade. Venetian merchants traveled to the Crimea, Asia Minor, and the Persian Gulf; Marco Polo brought glowing accounts from China and Persia. In her commercial expansion, however, Venice encountered the rivalry of another Italian maritime republic, Genoa, and a long struggle between the two powers was inevitable. The Genoese fleet, after reaching Chioggia in the Adriatic and endangering the existence of Venice itself, was utterly defeated there in 1380 leaving Venice the undisputed queen of the seas. In the meantime the oligarchy in Venice was gaining more and more power in the government of the republic. In 1297 membership of the Grand Council was restricted to members of certain families and names of those eligible were inscribed in a Golden Book. The only serious revolution, inspired by Baiamonte Tiepolo in 1310, failed, and in order to prevent further uprisings the Council of Ten (see TEN, COUNCIL OF) was instituted. Presided over by the doge himself, it was entrusted with the protection of public safety and with the vigilance against conspirators. In the second half of the 14th and during the 15th centuries, Venice began to acquire areas on the Italian mainland to protect her trade routes toward the north and west. By 1454 her possessions reached as far west as the Adda River, south to Ravenna, and north to the Alps. Such cities as Padova, Vicenza, Verona, Bergamo, Brescia, and Piacenza were in Venetian hands. The republic was an ally of Florence and the Duchy of Milan. This wide territory she held until the League of Cambrai, formed in 1508 by Pope Julius II, Emperor Maximilian I, and the kings of France and Aragon, stripped her of many of her possessions. However, most of the territory now comprised in the region Veneto returned soon after to Venice and remained under her administration until the dissolution of the republic in 1797.

After the conquest of Constantinople by the Turks in 1453, their power started to make itself felt throughout the Mediterranean. At first Venice succeeded in making commercial and financial agreements with the Ottoman Empire and to continue her oversea trade, but soon the Turks became able to press their expansion. In a long series of wars in the second half of the 15th and during the 16th century Venice lost more and more ground. Not even the victory of the Christian nations at Lepanto (1571) succeeded in checking the Ottoman advance. One by one the overseas possessions were lost. At the end of the 16th century the Venetian empire was shattered; gone were her military and commercial power, the first as a result of the long struggle with the Turks, the second also as a consequence of the new route to the Far East opened by the Portu-

GEORGES VIOLLON/PHOTO RESEARCHERS

The octagonal Santa Maria della Salute was built in the 17th century on the edge of the Grand Canal.

guese around the Cape of Good Hope. Also, with the discovery of the New World much world trade shifted toward the Atlantic. A last flash of Venetian strength came in 1683 when Morea was retaken from the Turks only to be lost some 30 years later. The republic, with its unchanged aristocratic government and its outdated institutions, continued its steady decline until the Napoleonic conquest of Italy. In May 1797 the Grand Council voted itself out of existence and soon after, by the Treaty of Campoformio, Venice was attached to the Austrian Empire; then, in 1805, she became part of the Kingdom of Italy under Napoleon's sponsorship. After the collapse of the Napoleonic empire in 1815, Venice was incorporated in the Lombardo-Venetian Kingdom under Austrian rule. In 1848, when revolutionary movements swept over Europe and the Risorgimento was in full swing in Italy, Venice rose against her Austrian rulers. The patriot Daniele Manin proclaimed a republic and, soon afterward, union with the Kingdom of Sardinia was voted. Even after the Piedmontese defeat at Novara in March 1849, Venice continued her resistance to the siege by Austrian forces, but in August she was forced into surrender, more by famine and cholera than by force of arms. Austrian domination was reestablished, and continued until 1866 when Venice was ceded by Austria to France. In the plebiscite that followed, the people of Venice voted overwhelmingly for union with the Kingdom of Italy, which took place the same year.

After the union, Venice suffered from the competition of the port of Trieste, which was the outlet of the Austro-Hungarian Empire until 1918. During World War I, Venice was subjected to aerial attack and damage to buildings and art work occurred. Although occupied by the Germans during World War II, the city escaped serious damage. A major flood in 1966 focused increased attention on a problem that had plagued Venice for centuries—it had been sinking into the sea at an alarming rate. Capping the city's artesian wells caused the underground water table to refill, and by the 1980's, Venice was even rising slightly. Air pollution was being brought under control, and efforts were under way to improve the sewage system. Studies were being conducted on ways to control the high tides.

Bibliography

Cole, Toby, ed., *Venice: A Portable Reader* (Lawrence Hill 1978).

Hale, John R., *Renaissance Venice* (Rowman & Littlefield 1973).

King, Margaret L., *Venetian Humanism in an Age of Patrician Dominance* (Princeton Univ. Press 1986).

Lovell, Margaretta M., *Venice: The American View 1860–1920* (Univ. of Wash. Press 1984).

McNeil, William H., *Venice—the Hinge of Europe: 1081–1797* (Univ. of Chicago Press 1974).

Martineau, Jane, and Hope, Charles, eds., *The Genius of Venice* 1500–1600 (Abrams 1984).

Morris, Jan, *The World of Venice,* rev. ed. (Harcourt 1974).

Muir, Edward, *Civil Ritual in Renaissance Venice* (Princeton Univ. Press 1986).

Shaw-Kennedy, Ronald, *Venice Rediscovered* (A.S. Barnes 1978).

Zorzi, Alvise, *Venice* (Abbeville Press 1983).

VENING MEINESZ, ven'ing mī'nes, **Felix Andries** (1887–1966), Dutch geophysicist, who made major contributions to the study of the earth's gravity and suboceanic crust.

Vening Meinesz was born in Scheveningen, the Netherlands, on July 30, 1887. He received a degree in civil engineering from the Technical University of Delft in 1910 and then accepted a position with the Dutch government to work on a gravimetric study of the country. He developed a method using two pendulums from which it was possible to obtain accurate gravity readings free from disturbances such as the effects of shifting soil. By 1921 he succeeded in measuring gravity at stations throughout the Netherlands.

For over 15 years beginning in 1923, Vening Meinesz developed a complex system of measuring and recording devices that afforded accurate gravity measurements at sea. He found that certain areas along deep-sea trenches exhibited lower-than-expected gravitational attraction. These bands, later called the Vening Meinesz belts of negative anomalies, he believed were caused by convection currents under the earth's crust.

Vening Meinesz was professor of geodesy at the Technical University of Delft from 1938 to 1957. In 1963 a new institute for geophysics and geochemistry at Utrecht University was named for him. He died in Amersfoot, the Netherlands, on Aug. 12, 1966.

VENIRE, və-nī'rē, a judicial writ at common law directing a sheriff or other officer to select and summon jurors. In a few states of the United States, venire is still issued before the drawing of a jury list, but statutes limit the method of selection. In most states, however, the issuance of process comes after a list of qualified persons is prepared. Statutory substitutes for summoning juries are sometimes called "venire," but may be designated as "order," "precept," "summons," or "process." Venire may also mean the list of jurors drawn who are to be summoned.

VENIZELOS, vâ-nē-zâ'lôs, **Eleutherios** (1864–1936), Greek political leader, who was especially skillful in the administration of foreign policy. He was born in Crete on Aug. 23, 1864. After studying at Syros and the University of Athens, he practiced law in Crete. He played an active role in the anti-Turkish revolt of 1896, was elected to the Cretan assembly, and subsequently became minister of justice. When Prince George of Greece, as commissioner of Crete, sought to monopolize power, Venizelos countered by establishing a rival provisional government and proclaiming union of Crete with Greece. This daring feat, though unsuccessful, forced George's resignation in 1906 and brought Venizelos much new support. In 1909 he was called to Athens to advise the Military League shortly after its coup d'état and in 1910, Venizelos became prime minister of Greece.

Although a republican, Venizelos preferred constructive revisionist solutions to violent revolt against the crown. He reformed the army and navy, adjusted taxes, and stabilized the nation politically. Even more successful in foreign policy, he initiated a Greek-Bulgarian alliance that was instrumental in the defeat of Turkey in the First Balkan War (1912–1913). During World War I, he supported the Allied cause in direct opposition to the pro-German, though nominally neutral, Constantine I (reigned 1913–1917, 1920–1922). When Venizelos became convinced that the royalists were aiding the Germans, he set up a revolutionary provisional government in Salonika (Oct. 9, 1916). Constantine abdicated under Anglo-French pressure, and Venizelos took over the government of the whole country and brought Greece into the war on the Allied side on July 2, 1917.

Venizelos' diplomatic skill at Sèvres (1920) won much territory for Greece, including some of the Aegean Islands, East Thrace, and Smyrna. In spite of these triumphs, he was defeated at the polls by a war-weary electorate (November 1920) and went into exile. The exhausted nation then suffered defeat in Asia Minor at the hands of the aroused Turks, and Venizelos returned to represent his country at the Lausanne Conference (1922–1923).

He served again as premier in 1924 (for less than a month) and from 1928 to 1932. This time he failed to institute major internal reforms, but his foreign policy continued to be effective. He arrived at agreements with Italy (1928) and Yugoslavia (1929) and reopened full diplomatic relations with Bulgaria. His most notable triumph was an understanding with Turkey that paved the way for the Balkan pacts of the 1930's.

The misfortune of being in power when the world depression broke cost Venizelos his parliamentary majority and his office in September 1932. His reputation was gravely damaged the following March when certain republican officers, without his consent, sought to seize power by revolution. After barely escaping assassination in June 1933, Venizelos became implicated in another attempt to overthrow the government (March 1935). The failure of this coup led to his final exile and set the stage for the Ioannes Metaxas dictatorship (August 1936). Venizelos died in Paris, France, on March 18, 1936.

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VENOM, ven'əm, a poisonous secretion of some animals, usually delivered by bite or sting. Venom generally is produced in special glands that often are associated with spines, teeth, or other piercing apparatus. Venom is most often used to subdue and kill prey or for defense, but in some animals it also functions as a digestive juice.

Most venoms are complex and act on the body in many ways. Most venoms that have been analyzed contain various mixtures of toxic enzymes and other proteins, including nerve poisons, tissue-destroying agents, heart poisons, and several enzymes that interfere with the body's complex biochemical machinery. One major group, the neurotoxic venoms, affects the brain and nervous system primarily, producing symptoms of nervous excitation or depression such as incoordination, tremors, convulsions, or paralysis. If poisoning is severe, death can result from respiratory paralysis. Another major group acts primarily by causing local tissue damage and disruption of blood cells. In severe cases death may result from circulatory collapse. Still other venoms produce a histaminelike response with manifestations of an allergic reaction. A severe allergic reaction in persons previously sensitized to such a venom can result in anaphylactic shock and even death. These and other venoms can also cause local skin irritation, redness, swelling, and itching.

The severity of a venom attack depends on several factors besides the nature of the venom. The age, size, and general health of the victim are important. Venom attacks in children are, for example, much more serious than in healthy adults. The site of the bite or sting is also significant, with those inflicted on the extremities generally less serious than those on the head or trunk.

Among marine animals, many sponges, sea anemones, and jellyfish produce venoms that cause skin irritations, sometimes severe; occasionally systemic symptoms; and rarely death. However, the Portuguese man-of-war and certain jellyfish and sea anemones produce highly toxic venoms that can cause severe illness and even death very quickly. The cone shell is also dangerous, producing a neurotoxic venom. Certain fishes—chiefly scorpionfishes (particularly the deadly stonefish), ratfishes, and some sharks—also secrete potentially lethal neurotoxins.

Many insects and arthropods inflict bites and stings that produce local effects and occasional systemic effects, but a few pose a more serious threat. In some persons bee and wasp stings may cause anaphylactic shock or even death. Ticks produce a neurotoxic venom that can occasionally cause paralysis and death. The bites of black widow and certain other spiders cause nervous-system excitation, muscle spasms, pain and hardening of the abdomen, and sometimes blood-system disturbances. Such bites can be but rarely are fatal. Similarly the neurotoxic venom of certain scorpions is dangerous. Local tingling or burning at the site of the bite is followed by malaise, restlessness, increasing agitation, and sometimes coma and death.

By far the best-known venomous animals are snakes. The venom of cobras, kraits, and coral snakes is primarily neurotoxic, with death—if it occurs—resulting from respiratory paralysis. The venom of rattlesnakes, moccasins, and copperheads causes local tissue damage, hemorrhage, and circulatory collapse.

VENTILATION, the process of supplying or removing air, by natural or mechanical means, to or from any space.

The ventilation of buildings was originally advocated for the purpose of removing from the air such impurities as the products of human respiration and perspiration and the gaseous products of combustion. Before 1920, the carbon dioxide (CO_2) content of air was considered as the most reliable index for determining its purity, and a maximum limit was set at ten parts of CO_2 per 10,000 parts of air on a volume basis. In fact, ventilation rates for public buildings were established in which the maximum permissible CO_2 content was limited to seven parts per 10,000. Normal free atmosphere has a CO_2 conten of about four parts per 10,000, and in industrial atmospheres the content may be considerably greater. Subsequent studies have shown that CO_2 contents as great as 100 parts per 10,000 (or 1%) are not harmful, and that it is only when CO_2 contents reach 5% or 6% that breathing becomes difficult. The limit of ten parts per 10,000 can be considered as unrealistic.

A distinction must be clearly made between the ventilation requirements for carbon monoxide (CO) and those for CO_2. Carbon monoxide is deadly to animal life, and where continuous exposure to the gas is necessary, as in garages, vehicular tunnels, and mines, the concentration must not exceed one part in 10,000.

Under normal conditions, where noxious gases are not present, modern standards for ventilation have been based on the outdoor air required in order to avoid objectionable body odors. These ventilation rates were established in the mid-1930's by laboratory studies in which controlled quantities of ventilation air were supplied to various occupants of a sealed chamber. The studies indicated that people in small rooms required more ventilation air than people in large spaces, and that children required more than adults. Odors from tobacco smoke are as annoying as those from the body. Ventilation rates for the reduction of tobacco odors are considerably greater than those for reduction of body odors alone. In fact, in large assembly halls with unrestricted smoking, tremendously large ventilation rates must be provided if reasonably clear vision is to be maintained in the hall. Thus the danger of fire is not the only reason for the prohibition of tobacco smoking in many auditoriums.

Physiological Aspects of Ventilation. The effect of odors on the occupant is likely to be more psychological than physiological. It is true that appetites may be dulled and headaches may result from exposure to odors, but physical damage to the body will be difficult to prove. As far as most of the common odors are concerned, the purpose of ventilation is an aesthetic one. However, certain toxic chemical substances, which may or may not have detectable odors, pose a definite threat to health. This is especially true in industrial situations. See INDUSTRIAL HEALTH.

Ventilation for the purpose of reducing airborne bacteria is only partly effective, since it does not prevent accumulation of bacteria on surfaces. Treatment of room surfaces with disinfectants and removal of bacteria-bearing dust are more effective than ventilation in reducing airborne infection.

Accepted Standards for Ventilation. Recommended ventilation rates for most public and private enclosures are dependent mainly on the extent of smoking in the space. The following table lists outdoor-air (or "fresh-air") requirements according to usual practice.

OUTDOOR-AIR REQUIREMENTS

Application	Smoking	Recommended cfm.[1] per person
Apartment	Some	20
Barbershop	Considerable	15
Beauty parlor	Occasional	10
Broker's boardroom	Heavy	50
Department store	None	7½
Drugstore	Considerable	10
Factories	None	10
Hospitals, private rooms	None	30
Hospitals, wards	None	20
Hotel rooms	Heavy	30
Offices, general	Some	15
Offices, private	None to considerable	25-30
Restaurant, cafeteria	Considerable	12
Restaurant, dining room	Considerable	15
Schoolrooms	None	30
Theater	None	7½

[1] cfm.: cubic feet per minute.

The most common examples of ventilation, and the principal reasons for ventilation, are:

(1) Removal of excess heat, as in a foundry.

(2) Removal of body odors, as in locker rooms.

(3) Removal of moist air, as in laundries.

(4) Removal of gases and fumes, as from plating tanks, spray-paint booths, and steel mills.

(5) Removal of dust, as in grinding operations.

(6) Removal of animal odors, as in shelters.

(7) Removal of gas fumes or dust to prevent explosions, as in flour mills or hospital operating rooms. (Some anesthetics are explosive or combustible gases.)

In the United States, both national and state industrial codes specify the ventilation rates for commercial and industrial establishments.

Natural Ventilation. The simplest form of ventilation results from the action of wind, which builds a positive pressure on the windward side of a building and reduces the pressure on the leeward side. Wind action is variable, both in magnitude and direction, so that the resulting ventilation is not controllable.

A second cause of natural ventilation is referred to as "chimney action," because of the following analogy: A column of hot gas in a chimney is lighter than a corresponding column of cold air outside of the chimney. The result is that the column of heavier outdoor air displaces the column of lighter air inside the chimney, causing a flow of air to occur. A building is similar to a chimney, since cool air will flow in at openings near the lower level and out through openings near the roof. Ventilation by chimney action may be accomplished on calm days, but the effect again, is variable.

Mechanical Ventilation. Ventilation by wind or chimney action is not only capricious but frequently insufficient. For this reason, mechanical ventilation by means of a fan is often introduced.

Centrifugal and Propeller Fans. The two most common types of fans are the propeller type and the centrifugal type. Desk and window fans are common examples of propeller fans, which are capable of moving large airflow rates against

relatively low resistance. The centrifugal fan can move air against a high resistance, such as that imposed by ductwork and filters. The ductwork may be connected to the inlet and discharge sides of the fan.

Exhaust fans are commonly of the propeller type, since air is discharged directly to the outdoors against small resistance. These fans are frequently combined with roof caps or provided with automatically operated shutters.

Supply and exhaust fans connected to a duct system are usually of the centrifugal type. In many applications, the noise of fan operation and air movement is of great concern, as in broadcasting studios and auditoriums. Noise can be minimized by careful engineering design and proper installation. In general, the higher the speed of a given fan, the higher the noise level of operation. Hence, large, low-speed fans are frequently selected over small, high-speed fans.

Air Distribution. Most ventilation systems require the use of an air distribution system, consisting of a central fan, a main duct, several branch ducts to the various rooms, and supply outlets to distribute the air to individual spaces.

The maximum velocity in a standard commercial duct system is about 2,200 feet per minute (fpm), but in high-velocity systems it may be as high as 8,000 fpm, with correspondingly smaller duct sizes for handling the same airflow rate.

Conveying a given airflow rate to a space is only part of the problem of proper air distribution. Air must be introduced into the space without the occupants being aware of the air distribution system. Furthermore, they should not be subjected to drafts, a draft being defined as air motion greater than 50 fpm. Air motion between 15 and 35 fpm is considered acceptable, and less than 15 fpm is considered to be stagnant. Location of supply outlets is also important. Favorably placed outlets include: (1) high sidewall vents so situated as to project air above the heads of the occupants; (2) ceiling outlets that spread the air at the ceiling level and mix it with room air; and (3) outlets at the floor or in window sills that discharge air vertically so that it spreads across the ceiling and mixes with the room air. Design procedures for air distribution systems are given in engineering books.

Exhaust Ventilation Systems. Industrial exhaust systems remove fumes, dusts, and vapors that may be harmful to the workers or would interfere with the manufacturing process. A complete exhaust system consists of an exhaust hood located at the source of contamination, branch ducts and main ducts to convey the air, and a fan. In the vicinity of the exhaust hood, the air velocities required to carry the air contaminants into the hood are: 50–100 fpm to remove vapors and gases from washing, degreasing, and welding operations; 100–200 fpm to remove paint from spray booths or dust from package filling; and 500–2,000 fpm to capture coarse material removed in grinding processes or abrasive cleaning.

In an exhaust system, air introduced into a ventilated space must be removed at the same rate. Make-up air may enter through windows or doors, but during cold weather these may be closed and interfere with proper operation. Inlet ducts provided with heating coils permit make-up air to be admitted to the space without causing discomfort to the occupants. Air introduced into a conditioned space can be regulated so that the air pressure within the space will be higher than that outside of the space. Under these conditions, a positive internal pressure will be created so that air, instead of leaking into the enclosure through window and door cracks, will filter out through these fissures. This will prevent the inflow of dust, pollen, and other pollutants present in the outside air.

Special Problems—*Mines.* Ventilation is required for safety and health in underground mines. In deep mines, ventilation air serves to remove dust, gases, and excessive humidity, and helps to regulate air temperatures. Not only does the presence of finely divided dust in the air present a potential explosion hazard, but rock dust is also a factor in the incidence of lung diseases. High humidity and temperatures affect not only the comfort of the men, but also the rate at which they can work without heat injury. The fan should be located outside the mine, where it will not be damaged in case of fire or explosion. The main shaft through which men are transported into the mine should not be used as a duct to convey exhaust air, since it may expose the men to smoke and fumes in the event of an explosion or fire. It may serve as a fresh-air intake except where freezing temperatures occur, in which case it is likely to accumulate ice. See also MINING—*Mine Safety.*

Garages. Garages should be ventilated to remove carbon monoxide gas and combustible vapors. An idling car produces carbon monoxide gas at an average rate of 0.59 cfm (cubic feet per minute). Outdoor air at the rate of 5,900 cfm per car would be required to maintain the carbon monoxide content at a safe level of one part in 10,000. This amount of outdoor air during the cold months would be prohibitively expensive to heat for the purpose of maintaining comfortable temperatures indoors. For this reason, exhaust systems with individual connections that fit over the automobile exhaust pipes are often used. These connections prevent the escape of exhaust gases into the working space, and the outdoor-air requirement is reduced from 5,900 cfm to only 100 cfm.

Tunnels. For a discussion of ventilation of major tunnels, see TUNNEL—*Ventilation.*

Pollen Removal. The problem of removing pollen grains and dust particles from outdoor air that is to be used for ventilation purposes is dealt with by the use of air-filtering devices, of which several effective types have been developed. See FILTER, MECHANICAL.

See also AIR CONDITIONING.

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Bibliography

Alden, John L., and Kane, John M., *Design of Industrial Ventilation Systems,* 5th ed. (Industrial Press 1982).
Brumbaugh, James, *Heating, Ventilating, and Air Conditioning Library,* 3 vols., 2d ed. (Macmillan 1983).
Clark, Deborah B., and Bradford, Debra, *Pressure Cycled Ventilators* (Prentice-Hall 1984).
Clifford, George, *Heating, Ventilating and Air Conditioning* (Reston 1984).
Croome, D. J., and Roberts, B. M., *Air Conditioning and Ventilation of Buildings,* 2d ed. (Pergamon 1981).
European Heating and Ventilating Association, eds., *The International Dictionary of Heating, Ventilating and Air Conditioning* (Methuen 1982).
Lindeke, Wolfgang, *Dictionary of Ventilation and Health* (State Mutual Bk. 1980).
Traister, John E., *Heating, Ventilating and Air Conditioning* (Prentice-Hall 1987).

VENTRILOQUISM, ven-tril'ə-kwizm, an ancient art of vocal and visual illusion, the production of speech and other sounds that appear to emanate from a source outside the speaker's person. Ventriloquial words are formed by retracting the tongue and moving only its tip, the voice being expelled from the slightly opened mouth. As the breath is released slowly through the glottis, narrowed by the retraction of the tongue, pressure is created, diffusing the sound. With the narrowed glottis muffling the tone, the illusion of distance increases in ratio to the degree of pressure built up when the mouth is nearly closed and the tongue retracted. These facts are contrary to the erroneous assumption that ventriloquial sounds originate in the abdominal region and are produced while the performer is inhaling, an assumption that may be partly due to the Latin roots of the word "ventriloquism" (*venter,* "belly" or "paunch," and *loqui,* "spoken"). The use of a ventriloquist's dummy, with moving lips operated by the ventriloquist and timed to coincide with the ventriloquist's speech, completes the speech and sight illusion. Pantomime is also used to create the auricular and optical illusion that sound is emanating from an area or object some distance from the ventriloquist, whose lips remain immobile.

The art of ventriloquism is presumed to have been handed down from person to person, although its precise origin is lost in antiquity. Archaeological studies trace ventriloquism to early Hebrew and Egyptian civilizations. It is also presumed that certain members of ancient priesthoods were practitioners of the art of voice diffusion. Tradition has it, for instance, that miraculous sounds of warning issuing from the stone of the River Pactolus in Lydia repelled thieves who were bent on stealing the golden sands of that stream. The speech of the Greek oracles and the speaking statues of the Egyptians give further credence to this theory of ventriloquial priestcraft. Among the ancient Greeks, Aurycles of Athens has been identified as a master of ventriloquism and leader of a group of practitioners referred to both as Eurycleides and Engastrimanteis ("belly-prophets"). India and China are areas in which ventriloquism is a familiar art. The Eskimo, Zulu, and Maori are among contemporary peoples of relatively primitive cultures among whom skilled practitioners of ventriloquism may be found.

Generally defined in the entertainment field as a form of conjury, ventriloquism continues to provoke mystery and call forth controversy. The point at issue is whether the ventriloquist throws his voice or whether this is an optical illusion that the artist creates by immobilizing his lips while speaking and effectively directing attention to the supposed source of the sound. At variance with the optical illusion theory is voice diffusion as practiced by birds and animals. The chickadee creates distinct ventriloquial effects by its note. A species of rabbit in Canada uses a high-pitched sound reputedly impossible to locate and capable of deceiving the rabbit's enemies as to its whereabouts. In further refutation of the optical illusion theory is the fact that dogs, in spite of their sensitivity to sound, seek the source of a ventriloquist's voice at the distant point from which it appears to emanate, and not in the person of the ventriloquist himself.

EDGAR BERGEN, *Ventriloquist*

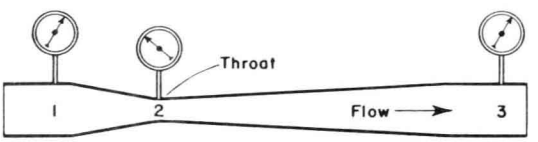
VENTURA, ven-tōōr'ə, a city in California, on the Pacific Ocean, 70 miles (112 km) northwest of Los Angeles. It is the seat of Ventura county. Oil and agriculture (lima beans, citrus fruit, and English walnuts) are its chief sources of income. Ventura county ranks among the highest in oil production in California, and the city's oil-tool manufactures compete in national and world markets.

Chumash Indians, Spanish rancheros, and American settlers contributed to the city's history. San Buenaventura Mission, founded by Junípero Serra in 1782, is still in use (the city's official name is San Buenaventura). The Ventura County Historical Museum has collections on local history.

Ventura was incorporated as a town in 1866 and as a city in 1906. Government is by council and manager. Population: 83,475.

VENTURI TUBE, ven-tōōr'ē, a type of conduit and metering device, named after G. B. Venturi, the Italian physicist, who about 1791 first investigated the principles upon which it operates. Clemens Herschel, the American engineer who first used it in 1886 to measure the flow of water, is generally credited as the inventor. The venturi tube consists of a pipe or other closed conduit with a constricted throat, followed by a gradually diverging section, as shown in the illustration. The effect of the constriction at point 2 is to increase the velocity and thus reduce the pressure of the fluid flowing through it. In the following diverging section between points 2 and 3, the velocity gradually decreases and the pressure increases until, at point 3, velocity and pressure are the same as they were at point 1, except for a slight loss due to friction.

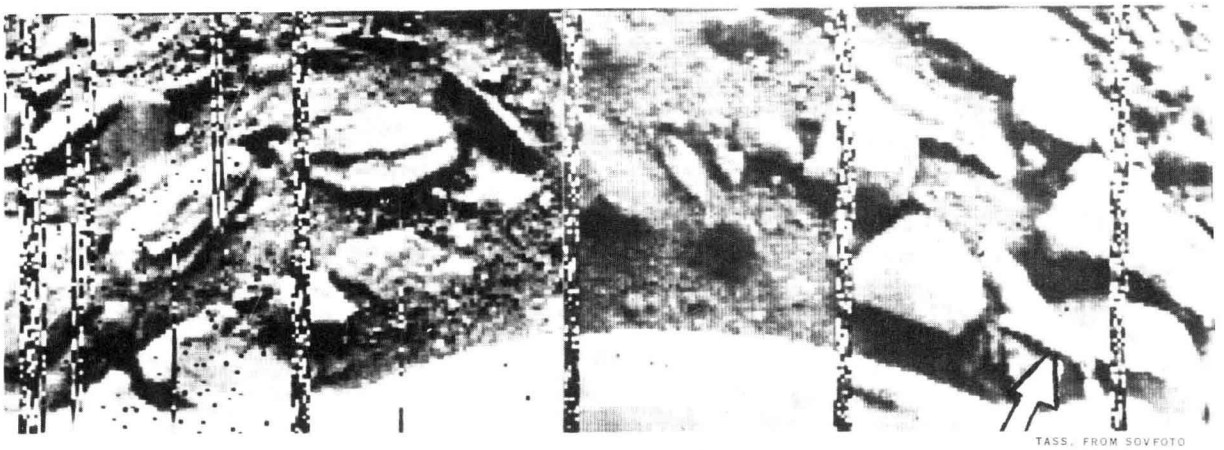
VENTURI TUBE



A major application of the venturi is in the measurement of the flow of fluids, both liquid and gaseous. It is also used in the common carburetor and in some pumps. In all cases its operation depends on the fact that there is a definite relationship between the rate of flow and the pressure differential between points 1 and 2. As a meter it is accurate within plus or minus 3% in measuring the flow of all types of fluid. By a suitable recording device, it can integrate the flow rate so as to give the total quantity of fluid that has gone through it in a certain period of time.

The venturi meter is the standard means of measuring water or steam flow in many industrial applications because it can be a permanent part of the system. In such cases, it is important that pressure loss be held to a minimum, and the diameter at the throat (point 2) will accordingly be made relatively large, with some sacrifice of gauge accuracy. There is no limit to the size of meter or the quantity of fluid that it can measure.

ELEANOR ALLEN, "*SAE Journal*"



TASS, FROM SOVFOTO

First photograph of the surface of Venus was returned to earth by the Soviet spacecraft Venera 9 on Oct. 22, 1975. The rounded rocks may indicate some wind and sand erosion. The arrow (*bottom right*) points to a density meter.

VENUS, vē'nəs, the second planet in the solar system (after Mercury) in order of increasing distance from the sun. It revolves around the sun in a nearly circular orbit, which lies between the orbits of Mercury and the earth. Like the other planets, Venus shines by reflected sunlight. As seen from the earth at night it is brighter than any other planet or star, both because of its proximity to the earth and because it is covered by highly reflective clouds.

Scientists believe that Venus and the other planets in the solar system were formed about 4.5 billion years ago when they condensed out of a cloud of dust and gas. Of the planets, Venus is most similar to the earth in size and mass, but with a much more massive atmosphere and a surface pressure 90 times greater.

Venus is a solid spherical body having a diameter of about 7,520 miles (12,100 km), as compared with the earth's diameter of about 7,920 miles (12,240 km). Its mass is about 81% and its density about 90% that of the earth. On the surface of Venus the acceleration due to gravity is about 88% of that on earth. Thus an object weighing 100 pounds (45 kg) on earth would weigh about 88 pounds (40 kg) on the surface of Venus. Extremely sensitive measurements made in 1979 from the U. S. spacecraft Pioneer Venus 1 (the Orbiter) were unable to detect any planetary magnetic field, though fluctuating fields originating in the solar wind are always present.

The first successful flyby of Venus was made by the U. S. spacecraft Mariner 2 in 1962, and the first drop of an instrument-carrying capsule into the atmosphere of Venus was made from the Soviet spacecraft Venera 4 in 1967. Subsequent U. S. and Soviet space missions radioed back data that greatly increased knowledge of the planet and its cloud cover. But man did not have his first look at the surface until Oct. 22 and 25, 1975, when Venera 9 and 10 landed on the planet and returned photographs. Venera 9 functioned for 53 minutes, and its pictures revealed piles of angular rock strewn about the landing site and resembling a young mountainscape. Venera 10 functioned for 65 minutes and photographed older, more weathered rock formations, presumably showing the effects of erosion.

In December 1978, Pioneer Venus 2 sent four probes to the surface; the carrier "bus" burned up in the upper atmosphere after sending back its own series of measurements. Pioneer Venus 1 (the Orbiter) was placed in a highly elliptical orbit, penetrating the upper atmosphere once per revolution and taking pictures of the cloud tops when farther away. A radar mapper disclosed a strikingly rugged topography at midnorthern latitudes, in contrast to the rather flat equatorial landscapes obtained by radar from earth. The first results included observations of a huge canyon, comparable to the African rift valley, and plateaus as high as the Himalaya and twice the size of the Tibetan plateau. Also in December, the USSR's Venera 11 and 12 probes reached the surface. All probes sent back information on the clouds, the atmospheric gases, and the energy flows that maintain a hot surface.

Orbit. Venus travels around the sun in a nearly circular orbit at a mean distance of about 67.2 million miles (108 million km), compared with about 93 million miles (150 million km) for the earth and 36 million miles (58 million km) for Mercury. As viewed from above the solar system, Venus and the other planets move counterclockwise around the sun. The mean orbital velocity of Venus is about 22 miles (35 km) per second, compared with about 18.5 miles (30 km) per second for the earth. Venus takes about 225 earth days to go around the sun, compared with

KEY FACTS ABOUT VENUS

Mass	5.3×10^{21} tons (4.8×10^{21} metric tons)
Volume	3.3×10^{22} cubic feet (9.3×10^{20} cu meters)
Density	318 lbs/cu ft (5.1 grams/cu cm)
Diameter	7,520 miles (12,100 km)
Surface gravity	28.3 ft per sec/sec (8.6 meters per sec/sec)
Escape velocity	6.5 miles/sec (10.4 km/sec)
Orbital velocity	22 miles/sec (35 km/sec)
Eccentricity of orbit	0.007
Mean distance from sun	67.2 million miles (108 million km)
Greatest distance from earth	160 million miles (257 million km)
Least distance from earth	25 million miles (40 million km)
Rotation period	243 earth days
Sidereal revolution period	225 earth days
Albedo (reflectivity of light)	70%
Surface temperature	885° F (475° C)
Surface atmospheric pressure	1400 psi (90 bars)
Number of satellites	None

about 365 days for the earth. At its closest, Venus is about 66.8 million miles (107.5 million km) from the sun. At its farthest, it is about 67.7 million miles (108.9 million km) from the sun.

Venus comes closer to the earth than any other planet. Its closest approach to earth, when Venus is between the sun and the earth, is at a distance of about 25 million miles (40 million km). Its greatest distance from the earth, when the sun is between Venus and the earth, is about 160 million miles (257 million km).

When viewed through a telescope, Venus displays a complete cycle of phases—similar to those of the moon—as the planet travels around the sun. These phases are due to the fact that different portions of the sunlit area of Venus are visible from earth as Venus reaches different orbital positions relative to the earth and the sun. But in contrast to the moon, Venus varies enormously in apparent diameter, from 10 seconds of arc when full to 64 seconds as a thin crescent. Because of the total cloud cover, no permanent detail can be seen. In the near ultraviolet, however, markings of low contrast can be photographed. Their motion is used as a tracer of wind speeds.

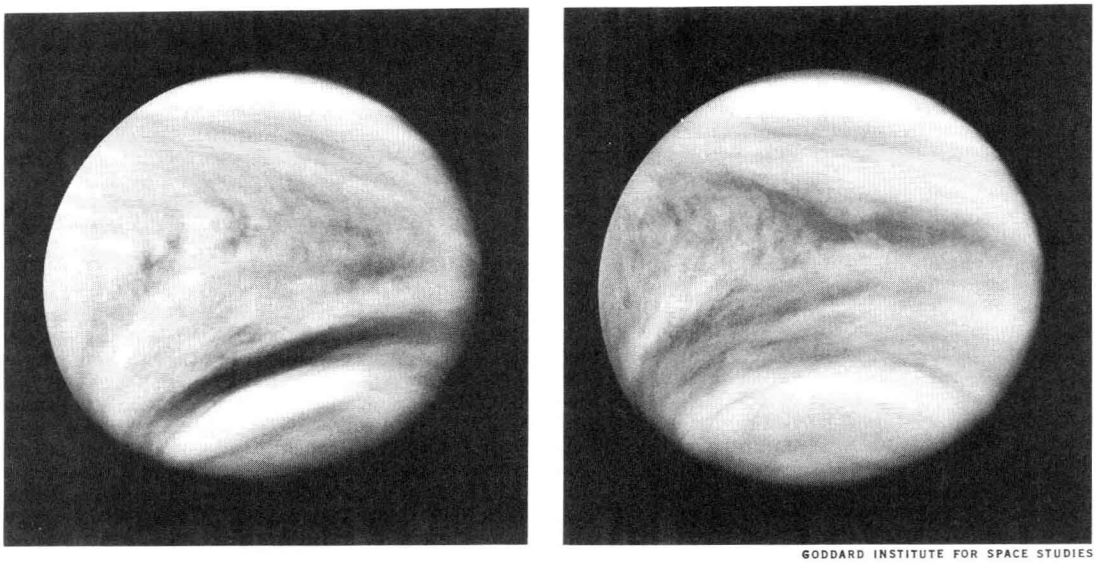
Rotation. As Venus travels around the sun, it rotates slowly on its axis in a direction opposite to that in which it moves around the sun. This rotation, called retrograde rotation, is clockwise as seen from above the north pole of the planet. Venus makes one complete rotation once every 243 earth days. The combination of these two motions gives Venus a solar day of 117 earth days—58.5 days each of light and darkness. The equator is very nearly in the plane of the orbit.

By what seems to be a remarkable coincidence, the same face of Venus (after five Venus solar days) is presented to earth every time the two planets come closest to each other, the longitude drifting by only a fraction of a degree per period. Attempts have been made to explain this phenomenon as a tidal lock between the earth and a permanent bulge on Venus, but they are unconvincing. One consequence is that earth-based radar maps, which are best at the shortest ranges, are largely confined to the one side.

Atmosphere and Clouds. As seen from earth, Venus is completely enveloped in clouds and haze. Remote measurements, always difficult and subject to varying interpretations, are therefore even more ambiguous. Much of our best information comes from the direct probing by U. S. and Soviet spacecraft missions. It has been found that the polar clouds have significant holes (invisible from earth) that permit viewing to much greater depths than the 40 miles (65 km) typical of lower latitudes. The temperature at this level is −30° C (−22° F), and it increases steadily with depth to the surface temperature of 475° C (885° F). The temperatures of cloud top and surface are uniform to within a few degrees, day to night and equator to poles. The cloud base is near 30 miles (48 km), where the temperature is not far below the boiling point of water. Some haze extends down another 10 miles (16 km) or so. The clouds proper are divided into three regions (lower, middle, and upper) by the characteristics of the particles measured by several entry probes. The boundaries lie at 32 and 35 miles (51 and 57 km). Measurements from earth and from orbit indicate the presence of a thin haze extending well above the 40-mile (65-km) level of the visible cloud top. The lowest cloud layer is sometimes very dense and sometimes nearly absent, and it may be the source of the possible lightning discharges reported by the 1978–1979 missions. A major component of the clouds is concentrated sulfuric acid,

An artist's rendering of a huge canyon on Venus, mapped by radar carried on the spacecraft Pioneer Venus 1.

NASA



GODDARD INSTITUTE FOR SPACE STUDIES

Ultraviolet photographs of the changing cloud layer enveloping Venus. Right photo taken one day after left photo.

but chlorine, sulfur, and other compounds seem to be present as well.

The atmosphere is about 95% carbon dioxide (CO_2), most of the rest being nitrogen (N_2). Water vapor is scarce, reported values ranging from 0.1% to a hundredth as much. At low altitudes there are reports of various sulfur compounds (SO_2, H_2S, COS) that seem to be decomposition products of the cloud particles. Oxygen is also very rare. The high temperature and noxious environment are extremely hostile to life as we know it.

If all the CO_2 in the earth's crust is counted, the two planets have similar total amounts. On Venus, the high temperature and the scarcity of water keep the CO_2 in the atmosphere.

Venus' slow rotation exerts a marked control over the winds, which blow from the east, the same direction as the rotation itself. At the cloud tops, the speed can be measured by following the motion of the features found in ultraviolet photographs and from the Doppler shift of spectral lines. The result is about 220 miles (360 km) per hour. At lower altitudes, the motion of entry probes (particularly the four vehicles of Pioneer Venus) has been tracked by radio. The speeds are found to drop steadily with depth to a very small value at the surface. Surface winds have been measured by cup anemometers on Soviet landers. Though small, the winds are adequate in the dense atmosphere to produce some erosion. The winds undoubtedly help maintain the global uniformity of temperatures at each level.

The high surface temperature itself is maintained by the "greenhouse effect," in which solar radiation heats the atmosphere on the way down to the surface, where the last few percent is also converted to heat. Cooling by thermal (infrared) radiation is inhibited by the blanketing effect of clouds and atmosphere. A similar, but much smaller, greenhouse effect is important on earth. Venus is by far the most extreme example known.

Upper Atmosphere and Ionosphere. Even if Venus turns out to have a small magnetic field, it is certainly too weak to withstand the solar wind (a very fast stream of ionized hydrogen carrying a weak magnetic field of its own). Venus is by far the best-studied body whose upper atmosphere is subjected directly to solar-wind impact, and in this respect it offers an interesting analogy with comets. The atmosphere is itself partly ionized by solar radiation (the resulting medium is called the ionosphere). This electrically conducting medium has electric currents and magnetic fields generated in it by the solar wind, which is therefore deflected around the planet in much the same way that air flows around a solid obstacle. Part of the ionosphere is caught up in the flow and carried around to the night side. The neutral atmosphere at these heights does not share the remarkable uniformity of temperature found at lower altitudes: it is near 200° F (about 100° C) on the day side but as cold as −240° F (−150° C) on the night side.

Surface and Interior. One lander photograph of the surface shows what appear to be sharp-edged rocks. On the large scale of radar maps are features reminiscent of continents, ocean basins, and rifts. There are objects resembling large volcanoes, and perhaps large impact basins as well. Natural radioactivity, measured by the Soviet landers, suggests that the rocks are granitic (continental) at two sites and basaltic (oceanic) at one. It is an irresistible temptation to conclude that Venus is tectonically active, although we certainly cannot say that it exhibits seafloor spreading as does the earth.

Planetary magnetic fields are believed to be generated by dynamo action in a fluid core. The behavior of earth, Mercury, and Jupiter would lead one to expect a magnetic field on Venus that would easily have been detected, even in the face of the fluctuating fields from the solar wind. The absence of such a field is one hint that Venus is fundamentally different from earth in some unknown way.

DONALD M. HUNTEN, *University of Arizona*

Further Reading: Burgess, Eric, *Venus: An Errant Twin* (Columbia Univ. Press 1985). The following issues of the journal *Science* are largely given over to reports of the findings of the Venus Pioneer Venus 1 and 2 spacecraft: Vol. 203, no. 4382, 743–808 (1979) and Vol. 205, no. 4401, 41–121 (1979).

VENUS, vē′nəs, in Roman religion, goddess of love, beauty, grace, and fertility. Originally an Italian deity, she later was identified with the Greek goddess Aphrodite, whose nature and deeds were assimilated to the Roman Venus. Venus was one of the least important Roman divinities before her association with Aphrodite. Though there is some evidence that Venus was worshiped in Rome at an early date as a spirit that particularly prospered the fertility of vegetation, it was not until 217 B. C. that her cult, as equivalent to that of Aphrodite, was introduced into Rome from Sicily, where as Venus Erycina (or Erucina) she had been established on Mt. Eryx.

In the developed mythology, Venus was the daughter either of Jupiter and Dione or of Uranus, whose severed genitals mingled with the sea and produced her from the foam. As the most beautiful goddess, Venus married Vulcan, the ugliest god, but she bestowed her love on various gods, such as Mars and Mercury, and several mortals, including Anchises and Adonis. Among her children were Cupid (god of love), Hymen (god of marriage), Priapus (god of gardens), and Aeneas (the Trojan ancestor of the Romans). Plants sacred to her included the myrtle, rose, and poppy. Among animals her chief favorites were doves and sparrows. As Venus Genetrix (Venus the Ancestress), she received special honors from Gaius Julius Caesar, who professed his descent from her through Iulus, her grandson by Aeneas. From Caesar's devotion was derived the subsequent incorporation of Venus Genetrix into the imperial cult. In art, Venus appears sometimes clothed or partly draped, but usually nude. Among her celebrated statues are the *Venus de Milo* and the copies of Praxiteles' *Aphrodite of Cnidus.*

P. R. COLEMAN-NORTON
Princeton University

VENUS AND ADONIS, vē′nəs, ə-don′is, an amatory poem in 199 six-line stanzas by William Shakespeare. It was first published in 1593 by Richard Field (like Shakespeare, a Stratford man) and was dedicated to the brilliant 20-year-old earl of Southampton, already a court favorite, whose patronage the poet sought. The poem, probably written the previous year after the theaters had been closed by the plague, was both Shakespeare's first published work and an immediate and continuing success. Sixteen editions appeared before 1640. The first edition was carefully printed and proofread and is the most authoritative one. For the narrative, Shakespeare combined two stories from Ovid's *Metamorphoses* and added other suggestions from the fashionable erotic poetry of Christopher Marlowe and Thomas Lodge.

Venus and Adonis, however, is less Ovidian than English and Renaissance. Deliberate artifice and aloofness are eschewed in favor of Warwickshire landscape and Elizabethan flora and fauna, sensuously presented. The story is not important. As Coleridge said later, we "seem to be told nothing but to see and hear everything." Nor should the poem be read as an erotic experience. It was Coleridge, too, who pointed out: "In this beautiful poem there is an endless activity of thought. . . ." The thoughts are embodied in discourses and argument about love and beauty, abstemiousness and excess, the nature of virtue. Beauty resides in the lover and is perpetuated by the union of lovers. What is not used is wasted, and all creation is essentially good. The poem is not about an attempted seduction but about the good and full life as the Renaissance conceived it, a life less of abnegation or licentiousness than of an approach to beauty. So read, Shakespeare's lovely verses have a meaning for all time.

ROBERT HAMILTON BALL
Queens College, New York

VENUS DE MILO, vē′nəs də mē′lō, a Greek statue, probably the most celebrated that has survived from classical antiquity. Found on Melos, one of the Cyclades islands, in 1820, the statue, also called *Aphrodite of Melos,* was bought by the marquis de Rivière, the French ambassador to the Ottoman Empire, and presented to Louis XVIII, who in turn gave it to the Louvre in Paris. Once ascribed to the 5th or 4th century B. C., it probably dates from between 110 and 88 B. C.

The statue is draped from the hips down. This invention, borrowed from the 4th century B. C. sculptor Praxiteles, asserts the beauty of the torso and gives the work a satisfactory foundation. The arms are broken off, and the problem of their original position continues to fascinate scholars and aestheticians. Some have conjectured that she was holding a shield to look at her reflection; others, that she was spinning thread. The unknown sculptor, a supremely gifted eclectic, produced an extraordinarily subtle figure that has both dignity and simplicity.

Venus de Milo was found on the island of Melos in 1820.

THE MANSELL COLLECTION, LONDON

VENUS' FLYTRAP, vē'nəs, also called Venus-flytrap and Venus's flytrap, a perennial flowering plant known for its unusual habit of capturing and digesting insects and other small animals. The digestion of animal protein provides the plant with nitrogen-containing amino acids, and —as in the case of other carnivorous plants—is probably an adaptation to nitrogen-poor soils.

The Venus' flytrap (*Dionaea muscipula*) is a member of the sundew family Droseraceae. Although known throughout the world, it is native only to one small area in the United States, a strip of mostly swampy ground covering perhaps as little as 700 square miles (1,800 sq km) in the vicinity of Wilmington, N. C.

The plant bears white flowers in clusters on stalks up to 12 inches (30 cm) long. Spreading from the stalk base are leaves 3 to 6 inches (7.5–15 cm) long. Each leaf broadens into a pair of kidney-shaped lobes that normally lie like a partially opened book and are fringed with long stiff bristles.

The Venus' flytrap is the most dramatic of insectivorous plants. Unlike the sundew, for example, which traps its victims with a sticky secretion, the flytrap imprisons its prey by suddenly snapping the lobes of a leaf together. Secretions inside the margin of the leaf act as a lure for crawling insects. Each leaf has six slender hairs, spaced so as to form a triangle on each lobe. When a crawler touches two of these hairs (or one hair twice, since a double stimulus is necessary), the lobes of the leaf close. Wind and rain usually do not trigger the mechanism.

Venus' flytrap screens its prey by not immediately pressing too tightly. The marginal bristles, which fold over loosely like the interlaced fingers of two clasped hands, form prison bars for prey large enough to constitute a worthwhile meal, but tiny insects can escape through the spaces between the bristles. After a few minutes' time, the lobes of the leaf slowly press more and more tightly together, killing soft-bodied insects. Digestion is usually completed in five to ten days, whereupon the leaf opens wide again, ready for the next victim.

VERACRUZ, ver-ə-krōōz', a state in Mexico, bordering the Gulf of Mexico from the Tamesí River in the northwestern part of the state to the Isthmus of Tehuantepec in the southeastern part. It extends no more than 100 miles (160 km) inland from a coastline more than 400 miles (644 km) long. It is bounded (north to south) by the states of Tamaulipas, San Luis Potosí, Hidalgo, Puebla, Oaxaca, Chiapas, and Tabasco. The area of Veracruz is 27,759 square miles (71,896 sq km).

Veracruz is predominantly mountainous. It has a narrow border of hot, humid coastland below the Sierra Madre Oriental, a range occupying the state's central and western portions. Pico de Orizaba (or Citlaltéptl), an extinct volcanic cone rising to 18,700 feet (5,700 meters) in central Veracruz, is the highest peak in Mexico and the third highest in North America. Cofre de Perote (14,048 feet, or 4,270 meters) is another major extinct volcano. In the north, the Tamiahua Lagoon, which extends 65 miles (105 km), has many large islands. Of the numerous rivers, the chief navigable one is Coatzacoalcos in the southeast. Rainfall is heavy, and the growth of tropical vegetation is exceedingly dense.

DR. WILLIAM E. HARLOW/PHOTO RESEARCHERS

A fly about to enter a Venus' flytrap. If the fly touches any two of the tiny trigger hairs on the inner surface, the bristled lobes of the trap will snap shut.

The state is an important agricultural and mining area. Important petroleum deposits underlying the coastal strip are being exploited. Leading agricultural products are cereal, corn, beans, fruits and vegetables, and sugarcane. Natural pasturage in the central highlands yields cattle and hides for export. The forests produce rubber, dyewoods, cabinet wood, chicle gum, and jalap. Manufactures include rum, textiles, tobacco products, paper, and chocolate.

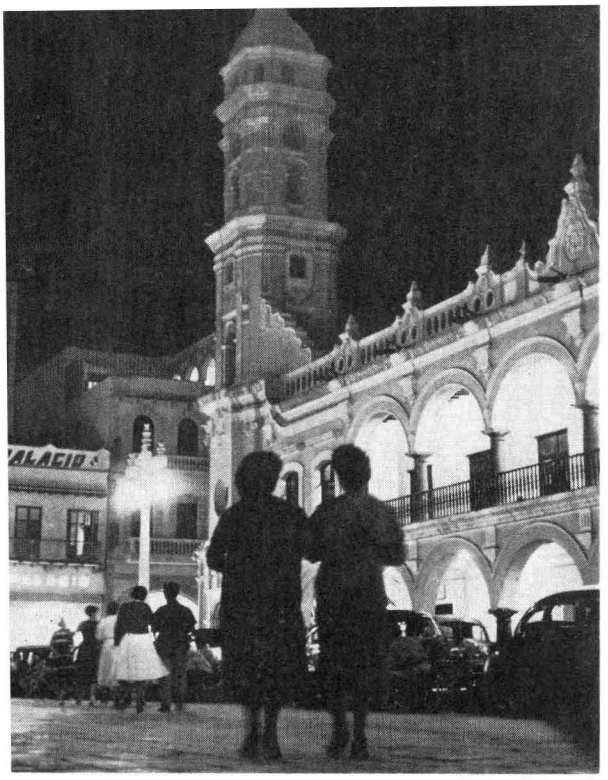
The chief city is Veracruz. Other important cities include Orizaba, a resort and textile center; Pánuco and Coatzacoalcos, petroleum centers; the industrial towns Córdoba and Tuxpan; and Jalapa, the capital.

The region now occupied by the state of Veracruz was the center of an Indian civilization antedating that of the Aztecs, farther west. Interesting ruins exist, and archaeological finds have been many. Population: (1976 est.) 4,917,000.

VERACRUZ, ver-ə-krōōz', a city in Mexico, the principal Mexican port of entry, located on the Gulf of Mexico, in the state of Veracruz about 200 miles (320 km) by air east of Mexico City. It has a harbor protected by breakwaters.

Veracruz (officially, Veracruz Llave) was the site of the first Spanish colonial post in Mexico, built in 1519 by Hernán Cortés, who used it as his base for the conquest of Mexico. He called it La Villa Rica de la Vera Cruz ("the rich town of the true cross"). The original settlement later was moved elsewhere, but it was reestablished in 1599 and subsequently served as a port for the Spanish fleet. Its lack of natural fortifications led to pillaging by pirates, especially in the years 1653 and 1712.

The city was captured by U. S. troops under Gen. Winfield Scott on March 29, 1847. Veracruz also fell to the French, first in 1838 and again in 1861. In 1914, U. S. forces occupied it for several months during a conflict with President Victoriano Huerta that led to his resignation.



Camera Press, Ltd.

Plaza and City Hall in the port of Veracruz. In the evening, following a Spanish tradition, chaperoned young ladies may stroll in the square and greet admirers.

The city of Veracruz is the terminal of several railroads and has air and passenger steamship services. Its manufactures include cigars, chocolate, liquors, tiles, and footwear. Its fine port facilities make it an export and import trade center. Important buildings include the colonial Fortress of Santiago, the Federal Custom House, and the City Hall. "Guarding" the harbor is the famous fort known as the Castillo De San Juan de Ulúa, built on Gallega Island, about a mile from the mainland. It was notorious as a prison before 1914. Not far from Ulúa is the Isla de los Sacrificios, a resort island important archaeologically for its ruins. There are excellent beaches south of the city.

Veracruz is an interesting mixture of the old and the new, with quaint old white-walled houses on narrow, cobbled streets contrasting with modern structures on broad thoroughfares. There are several spacious plazas, including the central Plaza Constitución, with its early 18th century parish church. The Alameda, or Plaza Zamora, has a bronze statue of Manuel Gutiérrez Zamora, a former governor of the state of Veracruz. There is also a monument to Benito Juárez, built to commemorate the Reform Laws, in the Parque Porfirio Díaz. Pop. (1950) 101,469.

VERACRUZ, Capture of. See MEXICAN WAR—*The Campaigns.*

VERAGUAS, bā-rä′gwäs, province, Panama, situated in central Panama, west of the canal, and extending across the peninsula from Mosquito Gulf of the Caribbean Sea, in the north, to the Pacific shore in the south, taking in the western part of the Azuero Peninsula and Coiba Island in the Pacific. The province covers an area of over 4,600 square miles. The land is amply forested, with stands of mahogany and other valuable hardwoods supporting a lumbering industry. Gold is mined in the Veraguas Mountains in the north, and there are deposits of magnesium, lead, mercury, zinc, and iron. Coffee, rice, sugarcane, and corn are grown in lower-lying regions. The province is bisected by the Inter-American Highway, which passes through Santiago, the provincial capital and principal town. Pop. (1950) 106,998.

VERATRUM, və-rā′trəm, genus of plants of the subfamily Melanthioideae, in the lily family (Liliaceae). The best known species are *V. viride,* the American false hellebore (also called green, or swamp hellebore and Indian poke), a native of the eastern United States and southeastern Canada; and *V. album,* the European hellebore (also called white hellebore). These species should not be confused with *Helleborus,* of the family Ranunculaceae. From fleshy, perennial rootstocks, the plants send up annual stalks three to eight feet tall, bearing panicled flowers and large, plaited leaves. Roots and rhizomes of *V. viride* and *V. album* contain many alkaloids, some of which are pharmacologically active. *V. album* is more toxic than the American species and no longer is used medicinally in the United States, although its powdered roots and rhizomes are employed as insecticides.

V. viride and extracts containing its hypotensive alkaloids are prescribed for primary (essential) hypertension. Only a small margin separates therapeutic and toxic doses. Major symptoms of veratrum poisoning, which may follow ingestion or inhalation of powdered rootstocks or ingestion of liquid preparations of the alkaloids, are vomiting, nausea, and retching, followed by prostration, muscular weakness, pallor, and shallow respiration. Death occurs from respiratory arrest. Antidotal treatment depends on the stage to which poisoning has progressed and may entail use of activated charcoal, morphine (if respiration is unaffected), carbon dioxide and oxygen inhalation, atropine, ephedrine, or caffeine.

ROBERTSON PRATT.

VERAVAL, vā-rä′vəl, town, India, a port of the Kathiawar Peninsula in Gujarat State. It is situated on the Arabian Sea, about 45 miles south of the town of Junagadh. The port once carried on a brisk trade with areas along the Persian Gulf, the Red Sea, and the East African coast, and was for a time the chief port of embarkation of Indian Muslim pilgrims to Mecca. Sea traffic is still brisk and varied and there is a variety of light manufacturing. Three miles to the southeast is the renowned Somnath Temple. Veraval was formerly included in the Muslim-ruled state of Junagarh (Junagadh) and retains a substantial Muslim minority. Pop. (1951) 40,378.

JOSEPH E. SCHWARTZBERG.

VERAZZANO, Giovanni da. See VERRAZANO.

VERB, vûrb, a term used by grammarians to designate a certain class of words, or part of speech, in a language. Formal, semantic, and functional criteria define the verb. To be recognizably distinct from other classes of words in