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How to use this volume

This is one of the ten volumes of the *Ready Reference and Index*, or Micropædia (Volumes I through X).

Begin all reference searches here.

To satisfy a reference inquiry quickly.

To learn what *The New Encyclopædia Britannica* contains in its many articles.

Enter these volumes at any alphabetical point. The entries have been designed to provide information or to direct readers elsewhere in ways that are self-evident. But knowledge of a few editorial conventions will provide fuller understanding of what is offered:

- 1. Cross references appear often—identified by *see*, *see also*, or *q.v.* (*quod vide*, for “which see”), or as RELATED ENTRIES—and always refer to other entries in the *Ready Reference and Index* in alphabetical order (Volumes I-X).
- 2. Entries are alphabetized as if they were one word, up to the comma, regardless of the number of words in the title. Thus *mountaineering* precedes *mountain goat*, whereas *charge*, *electron* precedes *chargé d'affaires*.
- 3. Directions, or *Index* references, are given to the page in the Macropædia (Volumes 1-19) on which a subject or aspect of a subject may be found in the longer articles.

Volume and page numbers immediately following the title of an entry always refer to a comprehensive article in volumes 1 through 19.

All other volume and page references follow the text and cite *sections* of the longer (Macropædia) articles: the small, or lowercase, letters following page numbers—a, b, c, d, and e, f, g, h—identify the quarter of the column in which a reference begins. See marginal illustration.

Another point about index references: *Major ref.* (for “major reference”) followed by a volume and page number always cites a reference that is more comprehensive than the references following and should be considered the principal place to look for broad coverage of the topic under discussion.

All other references carry brief descriptive phrases so that the reader may know what he may expect to find.

Index volume-and-page references are preceded by a small dot [.]. Underscored phrases are headings under which several index references are grouped.

ephedrine, an alkaloid compound formerly derived from the leaves of several species of Chinese shrubs of the genus *Ephedra* of the family Ephedraceae (*q.v.*, order Gnetales), but now made synthetically. It is used as a decongestant drug (*q.v.*).

Johnson, Samuel 10:244 (b. Sept. 18, 1709, Lichfield, Staffordshire—d. Dec. 13, 1784, London), poet, essayist, critic, journalist, lexicographer, and conversationalist, is one of the outstanding figures of English 18th-century life and letters.

REFERENCES in other text articles:
• Addison's prose style and fame **1:84a**
• advertising criticism **1:103h**
• book publishing history **15:228e**
• Boswell's friendship and biographical work **3:61h**

a	e
b	f
c	g
d	h

Anglo-Norman literature, the writings in the French dialect of medieval England, also known as Norman-French or Anglo-French. Beginning effectively with the Norman Conquest (1066), it became the vernacular of the court, the law, the church, the schools and universities, Parliament, and, later, of municipalities and trade. **Major ref. 10:1105d.**
• chansons de geste and the Tristan tale **15:1021d passim** to 1022g

excommunication, form of ecclesiastical censure by which a person is excluded from the communion of believers, the rites or sacraments of a church, and the rights of church membership, but not necessarily from membership in the church as such. Some method of exclusion belongs to the administration of all Christian churches and denominations, indeed of all religious communities.

Roman Catholicism distinguishes between two kinds of excommunication, that which renders a person *toleratus*, tolerated, and that which renders him *vitandus*, one who is to be avoided. The second and more severe form requires—except for certain crimes that incur it automatically—that the culprit be announced by name in public as *vitandus*, in most cases by the Holy See itself; this is reserved for the gravest offenses. Both kinds of excommunication bar the excommunicated person from the sacraments of the church as well as from Christian burial. There is a specified list, set out in the *Codex Juris Canonici* (*q.v.*), of actions that incur excommunication; the list was revised in January 1983 by Pope John Paul II to include abortion, violation of the confidentiality of confession, absolution by a priest of one who has committed a sin with the priest's assistance, profanation of the consecrated communion host, consecration of a bishop without Vatican approval, a physical attack on the pope, and heresy and "abandoning the faith." If an excommunicated person confesses his sin and undergoes penance for it, he is absolved; in some cases this absolution may come from any priest, but in many others it is reserved to the bishop or even to the Holy See alone, save in *periculo mortis* ("in danger of death"). Excommunication should be distinguished from two related forms of censure, suspension and interdict. Suspension applies only to clergy and denies them some or all of their rights; interdict does not exclude from the communion of the faithful but forbids certain sacraments and sacred offices, sometimes to an entire area.

Some churches do not use the term excommunication, preferring to speak of church discipline. Churches holding the Reformed order vest the authority for exercising discipline and, if need be, carrying out excommunication, in the session, which consists of the minister and the elders. The 30th article of the Westminster Confession of 1646 specified "admonition, suspension from the sacrament of the Lord's Supper for a season, and excommunication from the church" as the proper steps of discipline. The Lutheran tradition has followed Martin Luther's catechism in speaking of "the power of the keys" and in defining excommunication as the denial of the communion to public and obstinate sinners; the clergy and the congregation together have the right to exercise such discipline. In the Anglican Church the bishops have the right to excommunicate, but this right is almost never exercised. Where a Congregational polity and the principle of "believers' Baptism" are observed, discipline is often rigorous. In U.S. denominations of the Free Church tradition the term "churching" a sinner refers to excommunication.

· Calvin's fight for administrative use 3:673f
· Christian methods through the centuries 4:473a

· Orthodox Judaism split over Hasidism 10:324f
· papal authority over secular rulers 4:592b

excoriation (Latin *ex*, "out," and *corium*, "skin"), any loss of superficial skin substance, usually caused by scratching, that leaves a mark on the skin.

excretion, human 7:35, the removal of the waste products of metabolism and of surplus substances from human tissues.

The text article covers the functioning of the urinary system, including vascular considerations, the formation of urine, quantitative and qualitative tests of renal function, the volume and composition of urine and its collection and emission, hormones and the kidney, and biological considerations.

REFERENCES in other text articles:

- alkaloid fate in human body 1:596h
- anesthetic disposal by kidney and liver 1:867e
- antibiotic elimination by kidneys 1:986h
- blood transport of waste products 2:1113f
- brainstem mediation of urinary output 12:1005g
- dehydration and excretion disorders 5:560c
- dehydration and water losses 13:408g
- diagnosis of disease by urinalysis 5:693c
- drug action and elimination rates 4:189c
- drug elimination effects 5:1044e
- hypothalamic effects on urine output 12:1037f
- kidney and urinary tract diseases 7:54h
- life-support systems and urine removal 10:916h
- poison elimination techniques 14:621e
- sedative-hypnotic drug elimination 16:456d
- sulfonamide elimination in urine 4:191c
- vitamin metabolism 19:490d *passim* to 491h
- water and salt balance maintenance 7:430a

excretion and excretory systems 7:44, respectively, disposal of nitrogenous metabolic wastes and the systems that handle this function. The systems range from simple diffusion through the cell membrane in a single-celled protozoan to the complex kidney and its associated urinary ducts in the vertebrate.

The text article covers the general features, excretory mechanisms, invertebrate excretory systems, vertebrate excretory systems, and the evolution of the vertebrate excretory system.

REFERENCES in other text articles:

- comparative zoology
- animal organ systems comparisons 13:723c
- animal tissue comparisons 18:445c
- cell membrane export system 3:1049h
- embryology and phylogeny 5:635h; illus. 632
- general features and phylum comparisons 6:719a
- heat acclimatization mechanisms 1:33h
- lacustrine animal adaptations 10:615e
- nitrogen disposal adaptations 11:1032c
- transcellular transport in intestine 11:882e
- invertebrate
- annelid anatomy and function 1:933f *passim* to 934f
- arachnid varied types and functions 1:1063h
- Araneida structure and processes 1:1070h
- arthropod general characteristics 2:68d
- aschelminth water balance system 2:141c
- bivalve structure and function 2:1090f
- cephalochordate anatomical features 3:1148h
- crustacean structure and function 5:315e
- entoproct nephridial function 6:895g
- hemichordate glomerulus function 8:756b
- insect malpighian tubule functions 9:615g
- mite and tick organs 1:22d; illus.
- oncopod structures and function 13:569g
- pericardial coelom of mollusks 12:328h
- Platyhelminthes system description 14:549d
- protozoan waste products and elimination 15:126h
- soil organisms and humus formation 16:1017d
- sponge adaptations for waste disposal 14:853d

vertebrate

- allantois functions in embryos 5:630d
- amphibian internal water balance 1:704f
- bird structure and function 2:1058g
- Chondrichthyes urea regulation 16:496e
- chordate nephric tubules 4:450h
- dog and wolf territory marking and sex attraction 5:931c *passim* to 933g
- gills and kidney in fish 7:335c
- lizard features and waste removal 16:284f
- mammalian structures and adaptations 11:408b
- monotreme reptilian features 12:386d
- penguin salt glands 17:500b
- perissodactyl territory marking 14:84b
- reptile embryo systems and waste types 15:734b
- rodent urine concentration 15:976f
- salt elimination in marine birds 14:18h
- snake urogenital peculiarities 16:564g
- steroids of urine and feces 17:680d *passim* to 683d
- tuatara nitrogenous wastes 15:824f
- vasopressin effect on kidneys 8:1077h

- vertebrate digestive system comparisons 5:786h
- waterfowl method of salt elimination 1:946a

RELATED ENTRIES in the Ready Reference and Index: for

excretory products: see perspiration; urine
kidney types: archinephros; mesonephros; metanephros; pronephros
structures: cloaca; contractile vacuole; coxal gland; flame cell; glomerulus; kidney; loop of Henle; Malpighian tubules; nasal gland; nephric tubule; nephridium; nephron; nephrostome; renal corpuscle; renal gland; solenocyte; sweat gland; ureter; urethra; urinary bladder; Wolffian duct

excretory system, human 7:50, the various structures and organs in the human body that serve to remove waste products from the blood and eliminate them as urine.

The text article covers the kidneys, the ureters, the urinary bladder, and the urethra.

REFERENCES in other text articles:

- animal tissue comparisons 18:445c
- bladder and ureter function 7:41h
- embryonic kidney development 6:752e
- kidney structure and function 7:35d
- pregnancy's effect on urination 14:974a
- reproductive system interrelationships 15:691d; illus.
- water and salt balancing function 7:429h; illus. 432

RELATED ENTRIES in the Ready Reference and Index:

renal artery; renal calices; renal capsule; renal collecting tubule; renal pelvis; renal pyramid

excretory system diseases 7:54, pathological changes and functional disorders in the kidneys, ureters, urinary bladder, and urethra.

The text article covers functional aspects of excretory system diseases, diseases of the kidney (including acute renal failure, chronic renal failure, glomerulonephritis, vascular disease, and tumours), obstruction to the flow of urine, and diseases of the urinary tract (including obstruction, trauma, tumour, and infection).

REFERENCES in other text articles:

- biomedical models, table 1 5:866
- birth defects of the excretory system 2:1075e
- bone effects of kidney malfunction 3:25d
- cancer sites, types, and prognoses 3:768a; table 767
- childhood disorders and treatments 4:226b
- dehydration and kidney disorders 5:560d
- diagnostic techniques 5:688c *passim* to 693d
- drug action mechanisms 5:1046f
- drug effects on kidney function 18:284d
- endocrine system disorders 6:820b
- fluid intake in kidney disease 18:280c
- infant kidney disorders and treatment 4:222b
- kidney abnormalities and protein losses 13:415c
- metabolic disease effects 11:1056c *passim* to 1059b
- multiple myeloma and urinary protein 2:1142b
- pregnancy complications caused by kidney infections 14:979e
- spinal injury effects on bladder 12:1039d
- surgical procedures 17:822f
- therapeutic dietary protein restriction 13:424f
- urinary bladder nerve malfunctions 7:42h
- urogenital tract disorders 15:697g
- water and salt balance disorders 7:430c
- X-ray examinations 15:463h

RELATED ENTRIES in the Ready Reference and Index: for

kidney disorders: see artificial organs; glomerulonephritis; kidney stones; nephrosclerosis; nephrotic syndrome; pyelonephritis; renal cyst; renal failure; renal osteodystrophy; renal transplantation
kidney tumours: nephroblastoma; renal carcinoma
other: cystitis; enuresis; hematuria; uremia; urethritis; urinary tract obstruction

excretory system drug, general name for several types of drugs that affect the kidneys. Diuretics (*q.v.*) increase sodium and water excretion from the kidneys and also lower blood pressure. Urine excretion is decreased by anti-diuretics such as vasopressin, which allow the reabsorption of water by the distal tubules of the kidneys. Uricosurics (*i.e.*, drugs that promote the secretion of uric acid in the urine) used to alleviate the symptoms of gout include probenecid, allopurinol, and colchicine. *Major ref.* 5:1046f

•effect on kidney function 18:284d

Excursion, The (1814), long philosophical poem by William Wordsworth.

•Coleridge's influence on Wordsworth 19:930d *passim* to 931d

Exe, River, in England, flowing from its source on Exmoor in Somerset, only 5 mi (8 km) from the Bristol Channel, 60 mi across Devon to its estuary on the English Channel at Exeter, the lowest bridging point, and Exmouth. It is an important river for angling (salmon and trout), and yachting is popular on the estuary. There are paper and flour mills along its banks.

50°37' N, 3°25' W

•map, United Kingdom 18:866

Execias (Greek artist): *see* Exekias.

Execration Texts, ancient Egyptian texts dating to the end of the Middle Kingdom (c.



Clay figurine, c. 1800 BC, from Şaqqārah, Egypt, inscribed with a curse

© A.C.L. Brussels

2040–1786 BC) and usually of two types: rough human figures of clay and red pottery bowls. Each object was inscribed with the name of an actual or potential enemy of the pharaoh and with specific cursings and was then ceremonially smashed, signifying the crushing of all opposition to the monarch. Both foreign enemies, especially Asiatics, and Egyptians were cursed; thus the texts have been useful in showing the political situation of the Middle Kingdom before its collapse.

executive, in politics, the branch of government or the state charged with carrying out the laws and conducting public and foreign affairs. *Major ref.* 14:722d

•administrative law systems 1:91b
•special-interest group pressures 17:446g
•state and individual in conflict 17:614c

executive agreement, an agreement between the United States and a foreign government that is less formal than a treaty and is not subject to the constitutional requirement for ratification by two-thirds of the Senate. The Constitution does not specifically give a president power to conclude executive agreements; he may be authorized to do so by Congress, or he may do so on his sole authority, derived from his power to conduct foreign relations.

The majority of executive agreements have been made pursuant to a treaty or act of Congress. At times, however, presidents have used this device to achieve purposes that would not command the support of two-thirds of the Senate, as when Pres. Franklin D. Roosevelt, after the outbreak of World War II but before U.S. entry into the conflict, gave Great Britain 50 overage destroyers in ex-

change for the right to use certain bases. Since executive agreements are made on the authority of the incumbent president, they do not necessarily bind his successors.

Executive Office of the President, U.S. government office established under the Reorganization Act of 1939, in which a number of agencies were grouped under the close supervision of the president. Subsequently, its composition has been changed several times by legislation and executive order. Among the more important agencies in the Executive Office are the Office of Management and Budget, the National Security Council, and the Council of Economic Advisers.

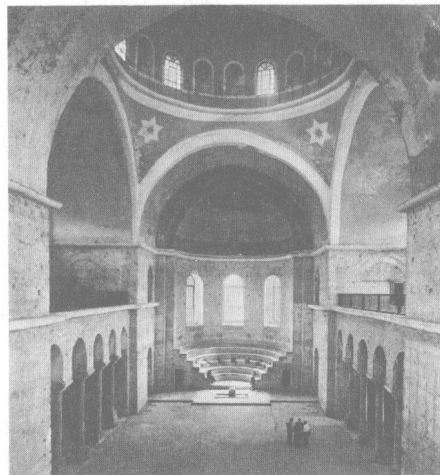
executor, in law, person designated by a testator—*i.e.*, a person making a will—to direct the distribution of his estate after his death. The system is found only in countries using Anglo-U.S. law; in civil-law countries the estate goes directly to the heir or heirs. The executor is usually a surviving spouse or other relative and achieves his position in most states even before the will is entered into probate, the judicial proceedings for determining the validity of the will. In all instances he is required to post a bond with the court as assurance that he will not abscond with the assets. He is required to dispose of the property in accordance with the provisions of the will. He must collect all debts due to the estate, as well as pay all those that are owed by the testator. He must then distribute the assets to heirs and legatees. If there is no will and no real estate and the heirs are able to agree upon the distribution of the estate, then an executor is not needed. *Major ref.* 9:594g

•trusts in civil law systems 18:729a

executory trust, in law, a trust that becomes effective through some further action by the creator of the trust or the trustee.

•trust law and types of trusts 18:727c

exedra, or EXHEDRA, in architecture, semicircular or rectangular niche with a raised seat; more loosely applied, the term also refers to the apse, or projection at the end, of a church or to a niche therein.



Exedra, Church of St. Irene, Istanbul, rebuilt by Justinian in the mid-6th century and again after 740
J. Powell, Rome

In ancient Greece exedrae were commonly found in the parts of major cities that had been reserved for worship, such as the Acropolis in Athens. Scholars and poets held discussions in the walled recesses, which were also used for rest and contemplation.

Exedrae were often constructed in Roman buildings, as in the Minerva Medica in Rome, where they were added in the 4th century to strengthen the supports of the heavy dome. Roman exedrae of both rectangular and semicircular design were sometimes topped with semidomes and often fronted with monumental columns or pilasters. In the Pantheon at

Rome, for example, three semicircular and four rectangular exedrae were constructed around the main interior wall, probably to house statues of the gods of the seven known planets. The exedra directly across from the entrance is domed; each of the remaining six exedrae is faced with two marble columns. Exedrae were also built outside Rome; for example, in Istanbul in the 6th-century Byzantine churches of SS. Sergius and Bacchus and St. Irene. *See also* apse.

exegesis and hermeneutics, biblical 7:60, respectively, the critical interpretation and the science of interpretive principles of the Bible. Used by both Jews and Christians throughout their histories, the primary purpose of exegesis and hermeneutics has been to discover the truths and values of the Bible.

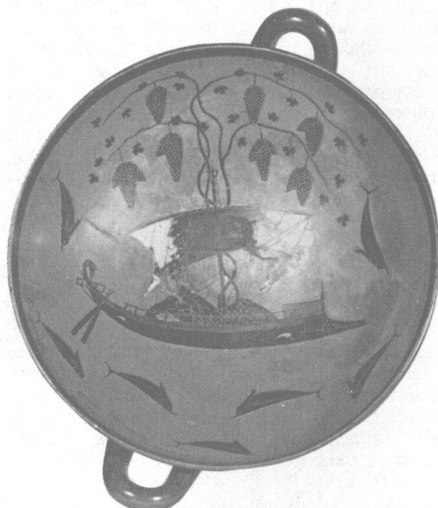
The text article covers the nature and significance of the subject, biblical criticism (textual, philological, literary, tradition, form, and other types of exegetical critical techniques), types of biblical hermeneutics (literal, moral, allegorical, and other hermeneutical principles), and the development of biblical exegesis and hermeneutics in Judaism and in Christianity.

REFERENCES in other text articles:

- advances in 19th century 15:618b
- agnostic critique of T.H. Huxley 1:311g
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- Eusebius of Caesarea's methods and approach 6:1130d
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- Gregory of Nazianzus' contribution 8:420f
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- Hillel's Talmudic approach 8:873c
- historical and mythological inquiry 15:623h
- Humanistic scholarship as parallel 8:1177f
- Isaian redemptive readings 9:910e
- Jesus Christ's biography reconstruction 2:948a
- Jesus tradition literary criticism 10:146c
- Jewish device of Haggadic myth 10:193e
- Jewish oral expository tradition 10:285a
- Joachim of Fiore's biblical study 10:225c
- Johanan ben Zakkai's contributions 10:229f
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- Old Testament criticism criteria 2:898c
- Origen's Hexapla and other work 13:735c
- Origen's work and medieval influence 4:539h
- patristic principles and debates 13:1080f *passim* to 1085a
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- Protestant impetus from emphasis on Bible 15:109f
- Protestantism and intellectualism in 1800s 15:117g
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- Talmud and Midrash concepts and history 17:1006a
- Talmud study and Hebrew revival 10:318f *passim* to 320e

- textual editing methods and problems 18:190d *passim* to 193a
 - theological verification of authority 18:275g
 - theology and science of religion 15:604d
 - typological interpretation approach 7:136e
 - Ugarit case for written patriarchal record 18:833a
 - Valla's criticism of New Testament 8:952c
- RELATED ENTRIES in the *Ready Reference and Index*: allegorical interpretation, biblical; analogical interpretation, biblical; form criticism, biblical Gematria; literal interpretation, biblical; literary criticism, biblical; middot; peshat; redaction criticism, biblical; sensus plenior; textual criticism, biblical; typological interpretation, biblical

Exekias, also spelled **EXECIAS** (fl. c. 550–525 BC), Greek potter and painter who, with the Amasis Painter, is considered the finest of black-figure masters of the mid-6th century BC and is one of the major figures in the history of the art. His name is found on eleven vases. The commonest inscription on the vases is



"Dionysus Crossing the Sea," interior of a kylix (shallow drinking cup) by Exekias, c. 535 BC; in the Staatliche Antikensammlungen und Glyptothek, Munich
Hirmer Fotoarchiv, München

"Exekias epoiesen me" ("Exekias made me"). In two instances, on an amphora (a two-handled wine container) in the Vatican and on an amphora in Berlin, there is written, "Exekias egraphse kapoiese me" ("Exekias made and decorated me"). These inscriptions are evidence that Exekias was both potter and painter.

On Exekias' amphora in the Vatican, the "made and decorated" signature appears in a verse on the rim. The "made" signature (the potter's signature) is repeated on the body of the vase. The vase represents Achilles and Ajax playing a board game on one side. On the other side is a young man, Castor, with his horse, Kyllaros; other figures are his mother, Leda, his father, Tyndareus, and his twin brother, Pollux (Polydeuces).

The scene of Achilles and Ajax is thought to refer to that day during the Trojan War that Achilles and Ajax, two champions of the Greeks, became so entranced in their game that they did not hear the call to battle at the Achaean camp. The mantles of Achilles and Ajax may illustrate the magnificence of Greek textiles contemporary with the Vatican amphora.

The second amphora "made and decorated" by Exekias is at Berlin. On one side it shows Heracles wrestling with the Nemean lion. On the other side are two Attic warriors, Demophon and Akamas, the sons of Theseus. This was probably one of Exekias' earliest works. Parts of it have been restored.

It is not certain how many of the nine remaining vases inscribed as "made by" Exekias were also painted by him. On some pieces, the

decoration is so slight that attribution is difficult to make. On others it is clearly by another hand.

There are vases that, although unsigned, have been attributed to Exekias on the basis of their stylistic relation to the Vatican amphora. Foremost among these are an amphora in Boulogne, Fr., illustrating a scene from the Sophoclean tragedy of the death of Ajax, and a calyx-krater (a vessel used for mixing wine with water) at Athens. The calyx-krater depicts a chariot-scene (probably of Athena accompanied by five deities) on one side and the fight for the body of Patroclus on the other. The krater was discovered on the north slope of the Acropolis during a U.S. excavation in 1938. It is probably the earliest example of what subsequently became a common shape for Attic vases. It is possible that Exekias invented this shape.

In addition to vases, Exekias was responsible for a set of clay plaques, about 15 inches high, of funerary scenes, designed to decorate a tomb. A kylix (a shallow drinking cup) now in Munich, of a type just coming into use in Exekias' time, also carries the potter's signature and depicts Dionysus reclining in a ship.

- Attic black-figure style development 14:899g; illus. 900
- black-figure painting style range 19:290f; illus. 291

Exemplar Humanae Vitae (1687; "Example of a Human Life"), book by Uriel Acosta.
·natural law and moral philosophy 10:214e

exemplum, short tale or example originally incorporated by a medieval preacher into his sermon to emphasize a moral or illustrate a point of doctrine. Fables, folk tales, and legends were gathered into collections, such as *Exempla* (c. 1200) by Jacques de Vitry, for the use of preachers. Such exempla often provided the germ or plot for medieval secular tales in verse or prose. The influence of exempla can be seen in many of Chaucer's *Canterbury Tales* (1387–1400), especially in the haunting moral parable "The Pardoner's Tale."
·antecedent of short story tale 16:713b

exemption, personal income tax, portion of income exempted from taxation. Although exemptions have usually been defended in terms of the relationship between the size of a family and its ability to pay taxes, the revenue needs of government have always been one of the main determinants of the existence and level of exemptions. As revenue needs of the U.S. federal government increased, for example, the personal exemption for a single person declined from \$3,000 in 1913 to \$600 in 1948 (\$625 in 1970).

The treatment of families varies widely among countries. Some provide different rate schedules; The Netherlands, for example, has a separate schedule for each family size. In others the size of the exemption varies with the number of children; it may increase or decrease more than proportionately with the number of children, the latter being the case in West Germany. A related provision for families is the family allowance system existing in many countries under which the government contributes to the support of children. Governments may or may not choose to coordinate the allowance system with the system of tax exemptions; Sweden, for example, eliminated personal exemptions for dependents when it instituted family allowances.
·economic plan promotion measures 6:261d

exequatur, permission granted by the government of one country to the consul or commercial agent of another, to enter the country and perform his duties there. This permission is entirely discretionary, and a government may withdraw it at any time.

exercise and physical conditioning 7:68, the training of the body to improve its function and enhance its fitness.

The text article covers the effect on the body of physical inactivity and of inactivity coupled

with a plentiful supply of food; the effect on obesity of exercise alone and of exercise coupled with a suitable diet; the physiological response to exercise of various degrees of intensity; and other aspects of physical conditioning.

REFERENCES in other text articles:

- beneficial effects on joints 10:259b
- blood circulation acceleration and oxygen demand 2:1128a
- dietary intake level correlation 13:424b
- disease causes and defense phenomena 5:842e
- fencing's recreational benefits 7:226b
- gymnastic sports training 8:513a
- medicine in ancient Greece 11:826g
- physical therapy for wasted muscles 18:286f
- respiratory disease and pulmonary ventilation 15:768g
- running training methods 18:544g
- swimming training methods 17:863f
- Taoist gymnastic practices 17:1039e
- urine flow affected by ADH 7:39d

RELATED ENTRIES in the *Ready Reference and Index*:

aerobics; Fartlek; isometrics; jogging; muscle tone; warm-up

exertional dyspnea, difficulty in breathing, caused by physical effort.

·heart failure symptom 3:894g

Exeter, cathedral city, county town (seat), and former county borough of Devon, England, on the River Exe about 10 mi (16 km) above the river's entry into the English Channel. The community derived its early importance from its position as a river crossing.

An early British tribe, the Dumnonii, made Exeter their centre, but it was subsequently taken over by the Romans, who named it Isca Dumnoniorum. It is said to have been the Caerwisc of the Britons, who were driven out by the Anglo-Saxon king Athelstan (925–939) in 926. Because it was the main town in south-west England during the Middle Ages, Exeter was subjected to a number of sieges. Alfred the Great (871–899) twice held it against the marauding Danes (877 and c. 894), but it was taken by Sweyn I of Denmark in 1003. In 1068, after an 18-day siege, Exeter surrendered to William I the Conqueror. Twice in subsequent centuries the town held out successfully—in 1497 against insurgent forces led by Perkin Warbeck, and in 1549 when the men of Devon and Cornwall rose against the introduction of the new *Book of Common Prayer* and other religious changes. During the English Civil War, the town declared for Parliament, but it was held by the opposing Royalists from 1643 to 1646.

Exeter had become a borough before the Norman Conquest of 1066. Subsequently Henry II (reigned 1154–89) granted the first charter that gave the burgesses all the free customs enjoyed by the citizens of London. By 1227 government by a reeve (a medieval official) had given place to that by a mayor and four bailiffs, a situation that continued until 1835. In 1537 Exeter was created a county in itself and remained so until the adminis-



Cathedral church of St. Peter at Exeter, Devon
Colour Library International

trative reorganization of English local government in 1974. Many trade guilds were incorporated in the city, the first, in 1466, being the tailors' guild, which, by 1482, had become so powerful that it was dissolved by the town government. The manufacture of woollen goods, introduced during Elizabeth I's reign (1558–1603), became important and at its peak was only surpassed in value by that of Leeds, in the North of England.

The Norman cathedral was consecrated in 1133, but the present cathedral, Church of St. Peter, was begun in c. 1275 and finished about 90 years later. It is in the Decorated style, apart from its twin Norman towers over the unique north and south transepts. Inside, the long, unbroken roof extends through the nave and choir without a central tower or lantern. The wooden episcopal throne is thought to have been made c. 1313–17. Some important manuscripts, including a famous book of Anglo-Saxon poetry are preserved in the chapter house. A complete restoration of the cathedral was carried out between 1870 and 1877, but in World War II (1942) air raids destroyed a small portion, including St. James's Chapel. Other buildings include the 14th-century Guildhall, which was rebuilt in 1468–70, while its frontage was added in 1592. The greater part of the Norman castle was demolished in 1744, leaving the Norman gateway, Athelstan's Tower, and the walls. The bombing of 1942, while it destroyed several churches and ancient houses, exposed many portions of the medieval city walls. Tuckers' Hall, originally the chapel and later the guildhouse of the still extant Guild of Weavers, Fullers, and Shearmen (incorporated 1489), was built in 1471. The Royal Albert Memorial Museum has natural-history and archaeological collections and an art gallery. Exeter's University College (1922) was reconstituted as the University of Exeter in 1955.

The port of Exeter is linked to the sea by canal. Distributive and service industries provide much employment. Among the relatively few and small manufacturing industries, metalworking, leatherworking, and the manufacture of paper and agricultural implements are the most important. Exeter is served by express trains from London to Penzance in Cornwall. The M5 motorway from Birmingham and Gloucester is planned to reach Bristol, Taunton, and Exeter. Pop. (1971 prelim.) 95,598.

50°43' N, 3°31' W

·map, United Kingdom 18:866

Exeter, town (township), seat of Rockingham County, southeastern New Hampshire, U.S., on the Exeter River at the falls of the



The Phillips Exeter Academy, Exeter, N.H.

Eric M. Sanford

Squamscott, southwest of Portsmouth. The town was founded in 1638 by the Rev. John Wheelwright and a group of exiles from the Massachusetts Bay Colony. During its early years it was a commonwealth independent of the English colonies, but an increasingly unfavourable economic situation forced Exeter

to voluntarily submit to the jurisdiction of Massachusetts in 1643. Later in the 17th century the area became part of the colony of New Hampshire. From about 1675 to 1725 the town was subjected to numerous Indian attacks, hindering its growth. A shipbuilding industry subsequently developed.

During the American Revolution Exeter was a patriot stronghold, and it served as the provincial capital. Manufactures now include textiles, leather goods, and electronic equipment. The Phillips Exeter Academy, a preparatory school, was founded there in 1781. Historic buildings include the Congregational Church (1798), Cincinnati House (1721), and the Gilman-Clifford, or Garrison, House (c. 1650). The town was the birthplace of Nicholas Gilman, a signer of the U.S. Constitution; Lewis Cass, secretary of state under Pres. James Buchanan; and the sculptor Daniel Chester French. Pop. (1980) 10,652.

42°59' N, 70°57' W

Exeter Book, the largest extant collection of Old English poetry. Copied c. 975, the manuscript was given to Exeter Cathedral by Bishop Leofric (died 1072). It begins with some long religious poems: the *Christ*, in three parts; two poems on St. Guthlac; the fragmentary "Azarius"; and the allegorical *Phoenix*. Following these are a number of shorter religious verses intermingled with poems of types the existence of which would have been unsuspected if this codex had not survived. All the extant Anglo-Saxon lyrics, or Elegies, as they are usually called—"The Wanderer," "The Seafarer," "The Wife's Lament," "The Husband's Message," and "The Ruin"—are found here. These are secular poems evoking a poignant sense of desolation and loneliness in their descriptions of the separation of lovers, the sorrows of exile, or the terrors and attractions of the sea, although some of them—i.e., "The Wanderer" and "The Seafarer"—also carry the weight of religious allegory. In addition, the Exeter Book preserves 95 "Riddles," a genre that would otherwise have been represented by a solitary example.

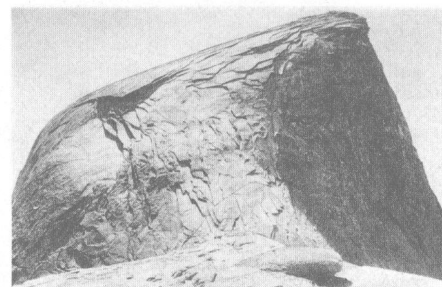
The remaining part of the Exeter Book includes "The Rhyning Poem," which is the only example of its kind; the "Gnomic Verses"; "Widsith," the heroic narrative of a fictitious bard; and the two "refrain poems," "Deor" and "Wulf and Eadwacer." The arrangement of the poems appears to be haphazard, and the book is believed to be copied from an earlier collection.

·Old English poetry collections 10:1107d

Exeter carpets: see Axminster carpets.

exfoliation, separation of successive thin shells, or spalls, from massive rock such as granite or basalt; it is common in regions that have moderate rainfall. The thickness of individual sheet or plate may be from a few millimetres to a few metres.

Some geologists believe that exfoliation results when rocks formed at depth are exposed at the ground surface; the previous compressional forces would decrease and thus allow the rock to expand by fracturing parallel to the surface. Quite often, however, the fractures are not parallel to the ground surface, and this circumstance is taken as an indication of some other method of formation. Large daily variations in temperature, especially pronounced in deserts, were also credited with producing exfoliation: expansion from heating during the day followed by contraction from rapid cooling at night was thought to cause the separation of thin slabs from large blocks of rock at the surface. This view has been discredited by careful experiments using an electric heating and cooling device; thousands of alternations between temperatures considerably higher and lower than those measured in deserts have failed to produce in samples of rock any fractures detectable even under high magnification.



Half dome displaying exfoliation, Yosemite National Park, California

By courtesy of the U.S. Geological Survey; photograph, F.C. Calkins

Study of thin shells that separate from rock exposed to the weather reveals as a common cause of the separation the slow development of clay minerals, which involves an increase in volume. The outer surface of exposed rock dries rapidly after wetting; but moisture that penetrates into minor crevices stays until some decay is started, and the resultant swelling causes flaking roughly parallel to the outer rock surface.

A small-scale form of exfoliation, called spheroidal weathering, is restricted to boulder-sized rock material and may occur at some depth within the Earth. In this case, rounded boulders are found surrounded by layers of disintegrated material.

·coastal area destruction processes 4:801d

exhalation: see breathing.

exhaust, in mechanical engineering, escape or removal of gases from an engine cylinder after they have done their work on a piston; also, the vapours so removed. In cyclical engines (steam and internal-combustion), spent gases must be removed through an exhaust port before a fresh charge is introduced. In engines with four-stroke cycles, one stroke, the exhaust stroke, expels spent gases through an exhaust valve.

·automotive emission-control devices 2:526f
·diesel engine design and development 5:727c
·gasoline engine construction 7:936h
·urban rainfall 18:1049g *passim* to 1051h

exhaustion, method of, in mathematics, invented by classical Greek mathematicians to prove propositions regarding the areas and volumes of geometric figures. Although it was a forerunner of the integral calculus, the method of exhaustion used neither limits nor vague arguments about infinitesimal quantities. It was instead a strictly logical procedure, based upon the axiom that a given quantity can be made smaller than another given quantity by successively halving it (a finite number of times). From this axiom it can be shown, for example, that the area of a circle is proportional to the square of its radius. The term method of exhaustion was coined in Europe after the Renaissance and applied to the rigorous Greek procedures as well as to contemporary "proofs" of area formulas by "exhausting" the area of figures with successive polygonal approximations.

·Archimedes' extension in geometry 1:1088c
·Euclidean geometry principles 7:1101c
·Eudoxus' method of curve calculation 6:1021f
·real analysis principles 1:783a

exhibitionism, illicit exposure of one's genitals as a preferred means of obtaining sexual pleasure. It usually occurs in males. In exhibitionism the mere showing of the genitals is not sufficient; some emotional reaction (such as disgust or horror) is sought from the person to whom exposure is made. Ejaculation may occur at or after exposure, or the patient may masturbate.

·behaviour patterns and causes 16:608a

exhibitions and fairs, organized displays of works of art, science, or industry for stimulating public interest, promoting manufactures, expanding trade, or illustrating the progress

and accomplishments of one or a wide variety of productive activities.

The earliest commercial fairs evolved in medieval Europe, where they served as centres of trade. In modern times they have become increasingly important, ranging in scope from special fairs dealing with one industry or branch of industrial production, such as automobiles or machinery, to general exhibits of goods and merchandise of every variety. Among the larger commercial and samples fairs, the most notable are the Milan Fair in Italy; the Leipzig Fair in East Germany; the International Trade Fair of Thessaloniki, Greece; the Baghdad Fair, Iraq; the International Samples Fair in Valencia, Spain; the Zagreb International Trade Fair, Yugoslavia; the Paris International Fair; the Canadian National Exhibition; and the several special national exhibitions exchanged between the U.S. and the U.S.S.R. It was estimated in the early 1970s that 820 general and 800 specialized commercial fairs were held annually in 76 countries. Some of the more popular specialized fairs include the International Textile and Clothing Industry Exhibition in Ghent; the Canadian Chemical and Equipment Exhibition in Toronto; the International Electrical Equipment Exhibition, Paris; the International Furniture Fair, Cologne; and the National Hardware Show, New York City.

The first of the general international exhibitions was the Crystal Palace Exposition in London in 1851, which became a model for many later exhibitions. The Paris Exposition of 1855 was held in the great Palais de l'Industrie on the Champs-Élysées. Altogether, about 34 major world fairs were held between 1851 and 1970. Until 1928 any country could organize an activity of this kind whenever it wished to do so. In that year, 35 countries signed a diplomatic convention in Paris to regulate the frequency and method of organizing world fairs. The convention later established the Bureau International des Expositions at Paris.

Some world fairs of note include the Philadelphia Centennial, 1876; the World Columbian Exposition, Chicago, 1893; the Chicago Century of Progress Exposition, 1933-34; the New York World's Fair, 1939-40; the Brussels Universal and International Exhibition, 1958; the New York World's Fair, 1964-65; Montreal's Expo 67, 1967; and Expo 70 in Osaka, Japan, 1970, the first world's fair to be held on the Asian continent.

- Geneva medieval economic growth 7:1011b
- medieval commercial growth 12:149c
- medieval trade and entertainment 4:635c
- popular song and audience participation 14:808h

Exile, Babylonian, the forced detention of Jews in Babylonia following the conquest of the Kingdom of Judah in the 6th century bc. The Exile formally ended in 538 bc, when the Persian conqueror of Babylonia, Cyrus the Great, gave the Jews permission to return to Palestine. Historians agree that several deportations took place (each the result of uprisings in Palestine), that not all Jews were forced to leave their homeland, that returning Jews left Babylonia at various times, and that some Jews chose to remain in Babylonia—thus constituting the first of numerous Jewish communities living permanently in the Diaspora (q.v.).

Many scholars cite 597 bc as the date of the first deportation, for in that year King Jehoiachin was deposed and apparently sent into exile with his family, his court, and thousands of workers. Others say the first deportation followed the destruction of Jerusalem by Nebuchadnezzar in 586; if so, the Jews were held in Babylonian captivity for 48 years. Among those who accept a tradition (Jer. 29:10) that the exile lasted 70 years, some choose the dates 608 to 538, others 586 to c. 516 (the year when the rebuilt Temple was dedicated in Jerusalem).

Although the Jews suffered greatly and faced

powerful cultural pressures in a foreign land, they maintained their national spirit and religious identity. Elders supervised the Jewish communities and Ezekiel was one of several prophets who kept alive the hope of one day returning home. This was possibly also the period when synagogues were first established, for the Jews observed the sabbath and religious holidays, practiced circumcision, and substituted prayers for former ritual sacrifices in the Temple. The concluding words of the Hebrew Bible show that the Jews looked upon Cyrus the Great as a great benefactor (he gave money to rebuild the Temple) and as one who fulfilled the will of God:

Now in the first year of Cyrus king of Persia, that the word of the Lord by the mouth of Jeremiah might be accomplished, the Lord stirred up the spirit of Cyrus king of Persia so that he made a proclamation throughout his kingdom and also put it in writing: 'Thus says Cyrus king of Persia, "The Lord, the God of heaven, has given me all the kingdoms of the earth, and he has charged me to build him a house at Jerusalem, which is in Judah. Whoever is among you of all his people, may the Lord his God be with him. Let him go up."' (II Chron. 36:23)

Major ref. 10:309b

- Babylonian conquest of Judaea 11:988d
- censorship in ancient Israel 3:1084a
- cultural interaction and Jewish myth 1:875a
- Exilarch's religious and political authority 10:297f
- Ezekiel's prophetic literature 2:918e
- Ezekiel's prophetic role in exile 7:127a
- first temple cultic and nationalistic significance 10:306b
- formative influence on Judaism 10:302g
- Jewish autonomous organization 10:317e
- Jewish eschatological reaction 10:293b
- Jewish self-concept effects 10:288b
- messianic response in Jewish thinking 11:1018b
- mystical and speculative results 10:184b
- Old Testament basis in history 2:897f
- Priestly Code development 14:1010c
- prophetic concept of remnant 15:64f

exile and banishment, prolonged absence from one's country imposed by vested authority as a punitive measure. Exile and banishment probably originated among early peoples as a means of punishment. The offender was made an outcast and deprived of the comfort and protection of his group. Exile was practiced by the Greeks chiefly in cases of homicide, although ostracism (q.v.) was a form of exile imposed for political reasons. In Rome, exile (*exsilium*) was originally a means to circumvent the death penalty. Before a death sentence was pronounced, a Roman citizen could escape by voluntary exile. Later, exile applied to all gradations of expulsion, whether it was temporary or permanent and whether citizenship was lost and property confiscated or not. In general, the Romans determined punishment by class: banishment was for the upper classes and forced labour for the lower.

From the Anglo-Saxon penalty of outlawry, English law developed the practice of banishing criminals as an alternative to capital punishment. By the 18th century, European countries were removing criminals to penal colonies (q.v.) in America, Australia, and Siberia. In the 20th century, political reasons became a major cause of exile.

- penology and punishment of criminals 14:1098e
- primitive death substitute 14:1038d

Eximbank: see Export-Import Bank of the United States.

Eximenis, Francesc (c. 1340-1409), Catalan author.

- Catalan literary traditions 10:1124a

exine, in plants, the outermost layer in the wall of a small reproductive body, or microspore (q.v.), or pollen grain (q.v.), which may have a sculpture pattern characteristic of a plant species.

- conifer life cycle 5:3d
- fossil spore and pollen structure 14:735c
- microspore cell wall morphology 1:880c

exinite (coal component): see clarain; durain.

existence theory, in mathematics, rules concerned with the class of theorems that state "if . . . , then there exists a solution such that" The establishment of an existence theorem is called an existence proof.

- combinatorics theory and method 4:946g
- *passim* to 953c
- Euclidean geometry principles 7:1108g
- foundational theory and method 11:631f

Existentialism 7:73, a family of philosophies (dating from about 1930) devoted to an interpretation of human existence in the world that stresses its concreteness and its problematic character. Existence is thus regarded as particular and individual; an avenue to the meaning of Being; and a challenge to choice—a choice that is conditioned by man's being-in-the-world (in a concrete and historically determinate situation).

The text article covers the nature of Existentialist thought and manner; the history of Existentialism, including its precursors, its immediate background and founding fathers, and its emergence as a movement. The article then deals with its methodological and substantive issues, including (under the latter) its fundamental concepts and contrasts, and its problems both as a philosophy and as a theology. It concludes with a discussion of its social and historical projections.

REFERENCES in other text articles:

- alienation as part of man's existence 1:575f
- atheism in the 20th century 2:260a
- belief system alternative to religion 15:597f
- Buber's educational philosophy impact 6:411e
- Buber's philosophy of encountering 3:359e
- Bultmann's modern theology 3:478h
- Christian existential theology 4:556b
- communication models and argumentation 15:799b
- ethics theory development 6:978f
- existence and consciousness 12:34e
- faith and mystery of Incarnation 4:559g
- French literature development 10:1234g
- Heidegger Phenomenological approach 8:738g
- Japanese philosophical trends 10:108d
- Jaspers' philosophical development 10:115e
- Kantianism criticism or rejection 10:397h
- Kierkegaard's contribution and impact 10:465b
- Kierkegaard's criticism of Hegelianism 8:734h
- Logical Positivist attack on Heidegger 14:879e
- Maihofer's view of natural law 10:720c
- major themes and writers 14:272b
- Marcel's autonomous metaphysical insight 11:489d
- mind as autonomous human faculty 12:231d
- music's ethical aspects 12:667a
- myth in modern scientific thought 12:797f
- Pascal and Kierkegaard on man 1:985a
- Phenomenology differences and influences on Sartre and Heidegger 14:211c
- philosophical influence in 20th century 16:987b
- Pietist theology of justification 14:460c
- Pirandello's art 14:470a
- political philosophies and writings 14:693g
- pragmatism related on value of change 14:940f
- psychiatric suicide studies 17:781e
- Realism in 20th-century literature 13:283g
- religious experience issues 15:647g
- religious insights and interpretations 15:622g
- Sartre's emphasis on the subject 16:256b
- Sartre's ideology and philosophy 9:196h
- Schelling's philosophy of nature 16:339c
- science's social relevance 16:391g
- skepticism as precursor 16:832h
- theological application to myth 4:550h

Existentialism and Humanism (1948), original French L'EXISTENTIALISME EST UN HUMANISME (1946), by Jean-Paul Sartre.

- affirmation of human dignity 14:694g
- Sartre's social philosophy 16:256h

Exmoor, high moorland, northwest Somerset and north Devon, England, forms a national park 265 sq mi (686 sq km) in extent. It borders the Bristol Channel on the north and has an exceptionally beautiful coastline of rugged headlands interspersed with narrow, wooded valleys, or coombs. Inland, beyond the fringe of farms, lies a bleak, misty plateau of heather moors, mostly more than 1,000 ft above sea level with Dunkery Beacon (1,706 ft [520 m]) as the highest feature. The moors remain grazing grounds for hardy Exmoor ponies and Exmoor horned sheep, and wild red deer are still hunted there. Tourism is important to the local economy, and Lynton, Lynmouth, and Porlock are the main centres. 51°10' N, 3°45' W

·map, United Kingdom 18:866

Exmoor (horse): *see* pony.

Exmouth, English Channel seaside town, county of Devon, England, on the east side of the mouth of the River Exe. It was early of maritime importance. Its fort, commanding the estuary, was captured by the Parliamentarians in 1646, during the Civil War. The older fishing and shipbuilding settlement has grown as a seaside resort and residential town and is much frequented as a yachting centre. Pop (1971) 25,827.

50°37' N, 3°25' W

·map, United Kingdom 18:866

Exmouth, Edward Pellew, 1st Viscount (b. April 19, 1757, Dover, Kent—d. Jan. 23, 1833, Teignmouth, Devon), admiral, a successful British commander in the French Revolutionary and Napoleonic Wars, was perhaps best known for his leadership of an Anglo-Dutch force that destroyed the Algerian fleet and silenced the shore batteries at Algiers (Aug. 27, 1816). His victory enabled the European powers and the United States to compel the Ottoman ruler of Algeria to abolish slavery for Christians.

In the U.S. War of Independence, Pellew, heading a small party of sailors, accompanied Gen. John Burgoyne's army from Canada into New York; taken prisoner when Burgoyne surrendered near Saratoga Springs (Oct. 17, 1777), he was paroled and returned to England. On June 19, 1793, he captured the first French frigate to be taken in the war with revolutionary France. On May 30, 1799, he quelled a mutiny on board his frigate and was credited with preventing the spread of the rebellion throughout the Royal Navy. As commander of the East Indies station (1804–09), he defeated a Dutch squadron off Java (Dec. 11, 1807). He became commander in chief for the North Sea in 1810 and for the Mediterranean in 1811. Created a viscount after his triumph at Algiers, he retired from the sea in 1821.

Exmouth Gulf, in Western Australia, inlet of the Indian Ocean, between North West Cape and the mainland. It is 55 mi (90 km) long north to south, 30 mi across the mouth, and has a maximum depth of 72 ft (22 m). When oil exploration proved unsuccessful in 1953, the gulf was developed for prawn fishing and pearl culture. U.S. communications centres were established in the 1960s on the cape. The west coast was charted by the Dutch navigator Abel Tasman in 1644. The gulf was named for Admiral Viscount Exmouth by Lieut. Phillip Parker King, who surveyed the coast (1818) in HMS "Mermaid." 22°00' S, 114°20' E

·map, Australia 2:400

Exobasidiales (fungi): *see* Basidiomycetes.

exobiology, also known as XENOBIOLGY, ASTROBIOLOGY, and EXTRATERRESTRIAL LIFE, a branch of space biology that deals with the search for extraterrestrial life, especially intel-

ligent life, outside the solar system. The word exobiology was coined by the U.S. geneticist Joshua Lederberg; the word commonly used in the Soviet Union translates into English as astrobiology.

Remote astronomical observations of a planet or other body provide information about its physical environment, but the determination of the presence of life is much more difficult. Techniques are designed to detect life-forms, artifacts produced by intelligent life, waste products of metabolic reactions, remnants of former life, prebiological molecules that may represent early evolutionary stages, or substances such as carbon that are necessary for life as it is experienced on Earth. Earth-based communication efforts have ranged from sending coded radio transmissions and pictorial diagrams by satellite to monitoring radio emissions from stars and starlike objects for long periods of time.

Even if extraterrestrial life is never found, experiments conducted in space under conditions difficult to establish on Earth (e.g., zero gravity) are valuable because they allow testing not only of accepted biological theories of life and its processes but also of relationships between biological and physical factors. *Major ref.* 10:904b

·germfree life as research tool 8:128c
·Marian life-support factors 11:529f
·Venus environmental possibilities 19:81g

Exocet, designated MM 38, a surface-to-surface tactical missile designed for use on surface warships. It is propelled by a two-stage solid-propellant motor and has a range of about 20 nautical miles (38 kilometres) at very low altitude. Exocet was developed by Aérospatiale for the French Navy.

·size, speed, and guidance 8:497d

exocoelom, embryonic coelom (*q.v.*) outside the embryo proper.

·embryonic development, illus. 1 6:743

Exocoetidae (family of fishes): *see* flying fish; halfbeak.

Exocoetoidei, suborder of fishes of the order Atheriniformes.

·classification, range, and features 2:273c

Exodus, the term used to describe the liberation of the Hebrews, under the leadership of the lawgiver Moses in the 13th century BC, from the bondage of slavery to the Egyptians; the event, of especial significance in biblical theology and in the Jewish religious year, is narrated in the Old Testament book of Exodus (*q.v.*).

·Aaron's career in Israel 1:2h
·biblical narrative of events 2:900d
·chronological sources of Jewish history 4:577f
·Egyptian supposed documentation 6:476a
·festal and historical significance 10:219g
·Judaic eschatology 6:595f *passim* to 961d
·miracles of Moses 12:270c
·Moses' leadership characteristics 12:487a
·mythical aspects and applications 10:191d
·Near Eastern historical evidence 17:940b
·origins of Judaism 10:304c
·religious year commemoration 4:601c
·Sinai Covenant ritualistic interpretation 5:229a

Exodus, Hebrew SHEMOT (Names), the second book of the Bible, the English name of which derives from the Septuagint (Greek Bible) usage where "exodus" was chosen to designate the deliverance of the Israelites from Egyptian bondage and their safe passage through the Sea of Reeds (Red Sea).

Chapters 1–18 narrate the sacred history of the Egyptian bondage, the Exodus from Egypt, and the journey to Mt. Sinai under the leadership of Moses. The second half of the book (chapters 19–40) tells of the Covenant that was established between Israel and God at Sinai and sets down the laws promulgated for the ordering of Israel's life.

Since Exodus continues the sacred story of the divine promise to Israel begun in Genesis,

it must be seen as part of a larger literary unit that is variously understood to include the first four, five, or six books of the Bible.

Scholars have identified three literary traditions in Exodus, designated by the letters J, E, and P. The J strand, so called because it uses the name Yahweh (Jahweh in German) for God, is a Judean rendition of the sacred story, perhaps written as early as 950 BC. The E strand, which designates God as Elohim, is a version of the sacred story from the northern kingdom of Israel, about 900–750 BC. The P (Priestly) strand, so called because of its cultic interests and regulations for priests, is usually dated in the 5th century BC and is regarded as the law upon which Ezra and Nehemiah based their reform. Each of these strands preserves materials much older than the time of their incorporation into a written work. Exodus thus conserves extremely old oral and written history.

The literary unit known as the Pentateuch (*i.e.*, the first five books of the Bible), of which Exodus is an integral part, was the first section of the Bible to achieve the status of sacred Scripture, probably in the late 5th or 4th century BC. *Major ref.* 2:900d

·narrative of Moses' leadership 12:489b

exogamy and endogamy, practices controlling the relation of the sexes and the selection of a spouse. Exogamous groups enjoin their members to marry outside the group, sometimes even specifying the outside group into which members must marry. Conversely, marriage outside a specific group may be forbidden, and for this restriction the term endogamy is used; more loosely it applies to a tendency to marriage within a group. Endogamy, rare among nonliterate societies, is likely to characterize aristocracies and religious and ethnic minorities in industrialized societies, but is also a notable characteristic of the caste system in India and of class-conscious nonliterate societies such as that of the Masai of East Africa.

Exogamy, more characteristic of nonindustrial societies, is usually based on ties of kinship, clan, or moiety (*see* dual organization) rather than on political or territorial lines. Since exogamous rules usually characterize unilineal descent groups, in which descent is reckoned either patrilineally or matrilineally, the marriage prohibition will apply only to one side of the family. Thus, some blood relations will inevitably be available for marriage.

The severity of enforcement of endogamous and exogamous restrictions varies greatly—from being an offense incurring capital punishment to one deserving only mild disapproval.

endogamy

·Alpine cultural patterns 1:628g
·American sub-Arctic Indian customs 1:695h
·caste system use and exceptions 3:982f
·Jewish theological conceptions 10:288a
·Mashriq marriage traditions 11:575b
·social sanctions on mate selection 13:1051f

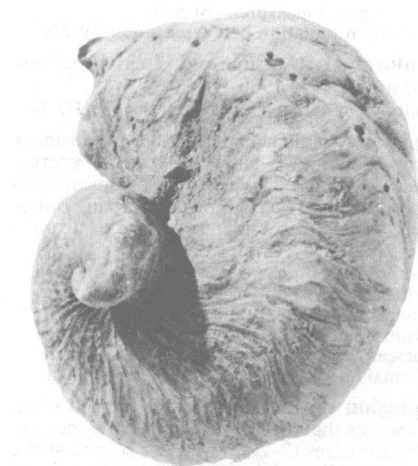
exogamy

·Amerindian artistic style influence 1:678e
·Homo erectus' probable practices 11:428h
·Hopi Indian forbidden marriage 17:307a
·Indian caste system use 3:986f
·South American forest culture customs 17:122b
·South American nomad family patterns 17:115c

exogamy and endogamy

·kinship and marriage customs 10:480b
·sexual behaviour controls 16:599f

Exogyra, extinct molluscan genus common in shallow-water marine deposits of Jurassic to Cretaceous age (between 190,000,000 and 65,000,000 years old). *Exogyra* is characterized by its very thick shell, which attained massive proportions. The left valve or shell is spirally twisted, whereas the right valve is flatish and much smaller. A distinctive longitudinal pattern of ribbing is well developed in the



Exogyra arietina, collected at Griffiths Ravine, Texas
By courtesy of the Buffalo Museum of Science, Buffalo

left valve, more often encountered in the field than the right valve, and pitting is common.

exonarthex (architecture): *see* narthex.

exopeptidase (class of enzyme): *see* proteolytic enzymes, pancreatic.

exophthalmic goitre (Graves' disease): *see* hyperthyroidism.

exophthalmos, also spelled **EXOPHTHALMUS**, also called **PROPTOSIS**, abnormal protrusion of one or both eyeballs. The condition in most cases results from accumulation of fluid in the fatty tissues that cushion the eyeball in its socket, or orbit. The usual cause of this swelling of the orbital tissue is Graves' disease, a type of hyperthyroidism (*q.v.*), but it may also follow the spread of infection from the paranasal sinuses or the teeth. Less common causes of exophthalmos include hemorrhage or aneurysm of the internal carotid artery and congenital glaucoma or severe myopia. *Major ref.* 6:825g

- eye diseases and treatment 7:117b
- fluid collection in fatty tissue 7:91h
- hyperthyroidism consequences 5:860b
- TSH and overactive thyroid 8:1076b

exopodite, in biology, part of a crustacean appendage.

- crustacean appendage variations 5:314c; illus. 313
- decapod anatomy and function 5:546h

Exopterygota, division (17 orders) of the class Insecta characterized by incomplete metamorphosis and resemblance of the juvenile and the adult.

- arthropod metamorphosis without molting 2:67h
- classification and characteristics 9:620d

exorcism, an adjuration addressed to evil spirits to force them to abandon an object, place, or person; technically, a ceremony used by the Christian Church to expel demons from persons who have come under their power. The rites and practices of primitive people to ward off or to expel evil spirits, sometimes considered exorcism, belong actually to the field of magic and witchcraft.

In the Christian tradition, Jesus expelled demons by a word and stated that this act was a sign of the coming of God's Kingdom. His followers, and others as well, drove out demons "in his name." In the first two centuries of the Christian Era, the power of exorcism was considered a special gift that might be bestowed on anyone, lay or cleric. About AD 250, however, there appeared a special class of the lower clergy, called exorcists, to whom was entrusted this special function. About the same time, exorcism became one of the ceremonies preparatory to Baptism, and it has remained a part of the Roman Catholic baptismal service.

The exorcism of persons possessed by de-

mons is carefully regulated by canon law in the Roman Catholic Church, and the elaborate rite is contained in the Roman ritual.

- Christian office and practices 4:516f
- non-Christian rites and practices
- Balinese dance-drama enactment 17:247h
- Bushman means of countering evil deity 10:451b
- Ceylonese devil dance performance 17:168b
- drugs used ritually to enhance effect 14:201e
- pageantry in tribal society 13:861d
- priestly function in ancient Near East 14:1009c

exoskeleton, a hardened integument, or "shell," that serves for support and protection in many invertebrate animals. Muscles and organ systems lie within the exoskeleton, unlike those of vertebrate animals, in which the muscles and organs surround most of the supportive skeleton.

- animal organ systems comparisons 13:722c
- arachnid protection from desiccation 1:1063b
- arthropod cuticle structure and molting processes 2:65c *passim* to 68h
- composition and dynamics 9:666h
- crustacean integumentary system 5:314h
- decapod mating and skeletal hardness 5:545b
- fossilization of arthropods 7:563h
- insect aquatic adaptations 10:615e
- insect cuticle functions 9:614c
- invertebrate and vertebrate forms 16:818e; illus. 820
- joint muscle arrangement, illus. 6 12:642

exosphere, outermost region of the atmosphere, where the number of molecules is so low that the probability of collisions between molecules is very small. The particles are acted upon only by the gravitational field of the Earth and follow what are called ballistic trajectories. The base of the exosphere has been estimated to be between 500 and 1,000 kilometres (300 and 600 miles) above the Earth's surface. Its outer boundary is defined as that level where the molecular density falls off to that typical of the interplanetary medium of our solar system, approximately 5,000 kilometres (3,000 miles) above the Earth's surface. Because from this region atmospheric molecules have an appreciable chance to escape to outer space, the base of the exosphere is called the critical level of escape; but because most molecules have speeds considerably lower than the escape velocity, the rate of escape is quite low. *Major ref.* 2:312a

- composition and location 6:89a

Exosporeae (subclass of slime molds): *see* Ceratiomyxomycetidae; Myxomycetes.

exostosis (medicine): *see* osteochondroma.

exothermic reaction, a chemical transformation accompanied by release of energy in the form of heat. When the total energy of the products of a chemical reaction is less than that of the reactants, the difference can appear as heat, manifested by a rise in the temperature of the products and unused reactants or of the external environment. If the reaction is constrained so that the substances present are kept at the same temperature from beginning to end, the amount of heat that must be removed is a measure of the amount of heat evolved during the reaction. The amount of heat evolved while the reacting system is kept at constant temperature and pressure is a measure of the change in the thermodynamic quantity called enthalpy, or heat content, of the transformation. Examples of exothermic reactions are the burning of a fuel; the formation of ammonia from its constituent elements, nitrogen and hydrogen; and the solution of hydrogen chloride gas in water to make hydrochloric acid. *Cf.* endothermic reaction.

- clay mineral response to heat 4:704a
- energy change in chemical reactions 4:174b
- hydrocarbon combustion reactions 9:80d
- metallurgical roasting process 11:1065g

exotoxin, classically defined as a poisonous substance secreted by certain bacteria. The term is now sometimes restricted to poisonous

proteins that are antigenic—*i.e.*, that stimulate the formation of antibodies—and formed by gram-positive bacteria. *Major ref.* 14:608c

- bacterial pathogenicity 2:575h; table 576
- diphtheria cause and symptoms 5:855e

expansion, increase in volume of a material as a consequence of a change of conditions, generally temperature or pressure; *e.g.*, water expands upon changing to ice, and a gas will expand as confining pressure decreases.

- kinematics of deformation 5:555b
- masonry materials tendencies 11:589f
- material thermal property measurement 11:629b
- natural gas recovery from reservoirs 12:861f

expansion, coefficient of (physics): *see* thermal expansion.

expansion joint, a joint designed to prevent the development of destructive stresses in a rigid structure upon thermal expansion.

- concrete roadway construction 15:897d

expansion valve, a valve through which liquid or gas under pressure is allowed to expand to greater volume and lower pressure.

- refrigeration equipment design 15:565d; illus.

Expectation, German **ERWARTUNG**, one-act opera by Arnold Schoenberg, composed in 1909, first performed in 1924.

- atonal composition development 16:350h
- chromatic harmony and Sprechstimme 13:591g

expectation, conditional, the expectation of the conditional distribution of two random variables—*i.e.*, the expected value of one of the variables as a function of the values of the other variable.

- probability theory and method 14:1105g

expectation, mathematical, of a random variable, the mean or average value of the random variable, being in the discrete case the summation of the product of each mass point times its mass (or relative frequency), and being in the continuous case the integral of the product of the random variable with its probability density function.

- probability theory and method 14:1105e

expectation value, in quantum mechanics, the weighted average of the various possible eigenvalues for a given state, each eigenvalue being weighted by the probability that it will be observed.

- thermodynamics statistical theory 18:312c

expectorant, agent causing the coughing up of fluid from the lungs and air passages.

- cough treatment with drugs 18:283h

Expedition of Humphry Clinker, The (1771), novel by Tobias Smollett consisting of letters written by the various members of a family who are making a tour of Britain. As well as describing the places visited, Smollett takes the opportunities presented for making satirical comment on human life.

- theme and composition 16:909b

expenditure tax, tax levied on the total consumption expenditure of the individual and collected from the consumer. It may be a proportional or a progressive tax; its advantage is that it eliminates the supposed adverse effect of the personal income tax on investment and saving incentives. Difficult to administer, it has been applied with only limited success in India and Sri Lanka (formerly Ceylon).

- tax levies of various types compared 17:1077b

experience. This topic is treated under the following titles: epistemology; Empiricism and Logical Positivism; human behaviour, development of; learning, animal; learning theories; memory; retention and forgetting; perception; religious experience; sensory per-

ception, human; thought processes, types of; and thought processes, theories of. The titles of these articles indicate the fields of scholarship or thought in which the idea of experience plays an important role.

Experience and Nature (1925), treatise by John Dewey.

·philosophical survey appraisal 5:681g

Experience and Prediction (1938), book by Hans Reichenbach.

·probability and conceptual meaning 14:880e

Experimental Aircraft Association, U.S. association of individuals interested in home-built aircraft, founded in 1953.

·homebuilt aircraft regulation 18:646b

Experimental Fighting Biplane No. 1, an experimental aircraft built by the Vickers company of Britain in 1913.

·fighter plane armament innovations 1:384g

experimental geophysics: *see* geophysics, solid Earth.

experimentalism (philosophy): *see* instrumentalism.

Experimental Novel, The, translation of LE ROMAN EXPÉRIMENTAL (1880), Émile Zola's manifesto of Naturalism, in which he applied to fiction the methods of observation and experiment practiced by the natural scientists.

·novelist as scientist 2:99g

experimental psychology, a method of studying psychological problems; the term generally connotes all areas of psychology that use the experimental method. The experimental method as it applies to psychology is an attempt to account for the activities of living and nonliving systems by manipulating variables that may give rise to behaviour; it is primarily concerned with discovering laws that describe manipulable relationships.

The areas of study in psychology that lean heavily on the experimental method include those of sensation and perception, learning and memory, motivation, and physiological psychology. There are experimental branches in most areas, however, including child psychology, clinical psychology, educational psychology, social psychology, even parapsychology. Usually the experimental psychologist deals with normal, intact organisms; but in physiological psychology, studies are conducted with organisms modified by brain or other nervous system surgery, radiation, drug treatment, induced convulsions, or long-standing deprivations of various kinds. The experimental psychologist often finds that his problems overlap those of physiologists, neurophysiologists, radiologists, biochemists, zoologists, pharmacists, physicists, and geneticists. *See also* behaviourism; psychophysics.

·research methods and hardware 15:150d

·Taine's scientific methodology 17:993d

experimentation, in modern philosophy of science, the use of observation, classification, prediction, and the verification of hypothesis by appropriate experiences. Usually claimed as innovations promoted by the 17th-century English philosopher Francis Bacon in modern times, the support of experimental method and the critique of empty theorizing can be traced at least back to Aristotle.

·empirical data manipulation 16:382e

·philosophy of Grosseteste and Bacon 14:259b

Experiment in Autobiography (1934), book by H.G. Wells.

·quality of work and ideas 19:758e

Experiment in International Living, educational-exchange institution founded in 1932 to further international understanding. It operates the School for International Training in Brattleboro, Vt. In the early 1980s it had national representations in 64 countries.

expert evidence, in law, testimony given on some technical or professional matter by a person considered an expert because of his special education or experience in the area.

·medical opinion in court testimony 11:814a

·procedure rules in civil law 15:11h

·testimony rights and procedure 7:5f

expiation (religion): *see* atonement.

expiration: *see* breathing.

Explanation, Act of, enacted in 1665 in England.

·Irish Restoration legislation 3:289c

explication de texte, detailed analysis of the elements comprising a literary work—such as the use of figurative language, image patterns, rhythm, ambiguities, and structure—and their relationship to the whole.

Practiced by Aristotle and used in England as a method of teaching Latin, it was developed extensively in French education. *Explication de texte* demands a rigorous application of close verbal and structural analysis of the work of art and forces the reader to question the rhetorical and logical patterns that organize the work.

The technique was introduced into modern criticism in England by I.A. Richards and William Empson in the 1920s and in the U.S. by Cleanth Brooks, all of whom were adherents of the New Criticism (*q.v.*).

exploitation of labour (economics): *see* surplus value.

Explorata (1641), also called SYLVA OR TIMBER, OR, DISCOVERIES MADE UPON MEN AND MATTER, work by Ben Jonson.

·theme and Shakespeare tribute 10:269c

exploration, space: *see* space exploration.

exploration, surface and underground 7:79, the methods and aims of Earth exploration.

The text article covers modern exploration and is primarily concerned with subsurface techniques. It is divided into two main sections, the first and shorter on the purposes of Earth exploration; the second on methods of subsurface exploration including geophysical and geochemical investigation, boring and sampling, on-site testing, and the special techniques used for sampling of permafrost and ice. *See also* core sampling, seismic survey.

REFERENCES in other text articles:

·Antarctic expeditions and research 1:962d

·Arctic exploration and research 1:1119a

·Humboldt earth science expeditions 8:1190b

·mine prospecting and exploration 12:247h

·ore deposit supply and discovery 13:662h

·Rocky Mountain surveys 15:965f

·Ross Ice Shelf explorations 15:1168g

·Ross Sea explorations 15:1161e

·surface mine exploration 12:254g

·uranium radiometric surveying 18:1035c

exploration, undersea: *see* undersea exploration.

exploration and discovery, voyages of: *see* geography.

exploratory behaviour, play or other activity of young animals that seems to be directed toward learning the features of their behavioral and physical environments.

·learning theories and studies 10:738b

Explorer, British experimental hydrogen peroxide-powered submarine built after World War II.

·submarine development adopted by United Kingdom 17:750e

Explorer, series of U.S. scientific satellites with launch dates beginning in 1958 and continuing into the 1980s. Data gathered by early Explorers resulted in discovery of the innermost of the two Van Allen radiation belts (*q.v.*).

·development and research capabilities 17:363f; table 364

·Earth's geoid measurement 6:6a

·Van Allen radiation belt exploration 19:21e

Explorer II, U.S. manned research balloon used in the early 1930s.

·balloons in aerospace research history 1:370h

explosion, violent expansion of a substance accompanied by a sudden release of energy. The cause may be a very rapid chemical reaction, a nuclear reaction, or the bursting out of gases or vapours under pressure, as from a steam boiler. *Cf.* implosion.

·compression injury to body systems 4:1043a

·industrial environment potential

hazards 9:531a

·motion picture study 12:553d

·nuclear explosion detection devices 19:601c

·thermal and chain reaction theories 4:957a

explosion crater, large crater formed when meteorites that have a velocity of greater than 3–4 kilometres (2–2½ miles) per second strike the Earth. The meteorite and adjacent soil are broken up by a shock wave that spreads from the impact point. The wave overcomes the molecular cohesion of the solid meteorite and transforms it to a highly compressed gas which expands and explodes, after which only tiny fragments of the meteorite material remain.

Explosion craters range in size from 100 metres (330 feet) to several kilometres in diameter. Rock flour and impactites (fragments of bedrock fused to form bubble-filled, glassy masses) are generally found within them. The largest meteorite craters are produced by explosion. Largest of all is the Ungava-Quebec Crater of Canada. Its diameter is more than three kilometres (about two miles).

·meteorite impacts and crater design 12:43c

·meteorite impact simulation 12:50c

explosion seismology, use of man-made explosions to determine earth structures, generally on a large scale. Large chemical explosive detonations and underground nuclear blasts generate seismic waves that can be used to interpret the Earth's interior, and they have the advantage over earthquake sources of being controllable in size, location, and timing of the source impulse. After correlating the different acoustical refracted and reflected recorded vibrations, it is possible to obtain information concerning depth and character of subsurface geologic structures. Explosion seismology is used extensively to locate petroleum occurrences and mineral deposits. The major limitations of the method are receiver sensitivity and the inhomogeneity of the earth structures being studied.

·marine sediment composition and structure 11:499g

explosives 7:82, substances that can be made to produce a great volume of gas in a short period of time, sometimes at very high temperatures. The energy of the expanding gases may be used for various industrial purposes such as mining, excavating, building, and engineering constructions.

The text article covers the types of explosives—chemical, mechanical, and nuclear. Sections are included on black powder; nitroglycerin; dynamite and other explosives; chlorates and perchlorates, Sprengel explosives, liquid oxygen explosives, nitrostarch explosives; modern high explosives; nitrocellulosic explosives; blasting caps; detonating cord; military explosives; and miscellaneous industrial applications of explosives.

REFERENCES in other text articles:

·acetylene handling dangers 7:927g

·aftershocks of nuclear explosions 14:433e

·ballistic explosive projectile design 2:659c

·chemical industry's nitrogen production

4:135a; illus. 129

·dynamite use in Alpine tunnelling 18:654a

·explosion and detonation theories 4:957a

·gunnery technology in 20th century 8:493f

·gunpowder development 19:683e

·gunpowder in history of ammunition 1:698h

- gun propellant detonation 2:656b
- lead detonator production 10:730f
- mercury fulminate synthesis 11:923b
- military engineering history 6:864f
- mining explosives technology 12:249f
- missile warhead armament 15:936c
- nuclear fission bombs and energy 13:302a
- piezoelectric grenade detonation 14:463g
- rare-earth ignition cautions 15:526h
- river-ice thawing by blasting 9:169f
- safecracking use 11:12b
- technical development in the 1900s 18:43b
- tunnelling methods and equipment 18:756b

RELATED ENTRIES in the *Ready Reference and Index*: for

explosives: see black powder; blasting cap; dynamite; mercury fulminate; nitrocellulose; nitroglycerin; PETN; picric acid; primer; RDX; trinitrotoluene

other: blasting; fireworks

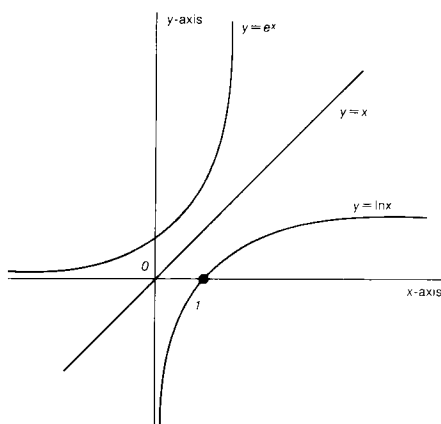
Expo 67, "Universal and International Exhibition" held at Montreal in 1967 to celebrate the 100th anniversary of Canadian confederation. More than 60 nations participated.

- architecture of world's fairs 19:473b
- site choice and effect on Montreal 12:411g

exponent, name for a symbol that specifies the number of like terms composing a product or that specifies a generalized form of such a concept. In the product $4 \times 4 \times 4$ there are three like terms, each composed of the number 4; thus, 3 is the exponent and the product may be written 4^3 . More generally, the expression a^b , with exponent b , can be given a mathematical meaning even if a and b are not natural numbers, but belong to a wider number system or algebraic system.

- arithmetic laws and principles 1:1172g
- history of calculatory device and table 11:650d
- logarithm use 11:681h

exponential function, in analytic and trigonometric geometry, a relation of the form



Curves of exponential functions

$y = a^x$, with the independent variable x ranging over the entire real line, as exponent (exp) of positive a . Probably the most important of the exponential functions is $y = e^x$, sometimes written $y = \exp(x)$, in which e is the base of the natural system of logarithms. By definition x is a logarithm, and there is thus a logarithmic function the inverse of the exponential function (see the Figure). Specifically, if $y = \exp(x)$, then $x = \ln y$, in which \ln is a natural logarithm (q.v.). The exponential function $\exp(\pm x)$ is also defined as the sum of the series

$$e^{\pm x} = 1 \pm x + \frac{x^2}{2!} \pm \frac{x^3}{3!} + \frac{x^4}{4!} \pm \frac{x^5}{5!} + \dots$$

which converges for all x and in which $n!$ is a product of the first n positive integers. Thus in particular, the constant

$$e = 2.7182818 \dots$$

$$= 1 + \frac{1}{1!} + \frac{1}{2!} + \frac{1}{3!} + \dots + \frac{1}{n!} + \dots$$

The exponential functions are examples of so-

called non-algebraic, or transcendental functions. Others are the logarithmic functions and the hyperbolic functions. Exponential functions frequently arise and quantitatively describe a number of phenomena in physics.

- functional analysis fundamentals 1:759f

Export-Import Bank of the United States (Eximbank), one of the principal agencies of the United States government in international finance, originally incorporated as the Export-Import Bank of Washington on Feb. 12, 1934, to assist in financing United States exports. It became an independent agency in 1945 and in 1968 it was given its current name. The agency must be reauthorized by Congress every five years.

The bank operates four principal programs: (1) direct long-term loans; (2) guarantees (principally to commercial banks); (3) short-term and medium-term insurance; and (4) discount loans to commercial banks. The greatest dollar volume of bank assistance has consisted of direct financing to buyers abroad of U.S. goods and services. This assistance has taken the form of long-term credits to public or private entities for the purchase and export of capital equipment and related services; credits to foreign lending institutions for re-lending to local enterprises; credits to countries suffering temporary dollar shortages to maintain the flow of U.S. trade; and agricultural commodity credits. Through these programs the bank has become involved in the promotion of development projects in less developed countries.

The bank's loans, which are made in dollars and repayable in dollars, are extended for specific purposes. The bank is required to encourage and supplement private capital but not compete with it. It is authorized to have outstanding in loans, guarantees, and insurance an amount not in excess of \$40,000,000. Operating funds for these loans and other requirements are derived from repayments of principal and interest on loans; guarantee fees and insurance premiums; capital stock of \$1,000,000,000 subscribed by the United States; retained earnings; borrowings from the U.S. Treasury of up to \$6,000,000,000; and the proceeds of sales of the bank's debentures, promissory notes, and interests in its portfolio of loans. The bank is governed by a five-man board of directors.

- credit insurance administration 9:650a

exports: see trade, international.

exposition, in sonata form, initial section including the statement of musical material in at least two contrasting keys, or sets of inter-related notes and chords.

In a fugue, an exposition is a section in which the subject, or principal theme, is stated in each of the voice parts.

- chamber music forms after 1750 4:23g
- concerto modification of sonata form 4:1064h
- dramatic principle of key contrast 17:911c
- fugal thematic elaboration 7:769e
- sonata's expansion by Schubert 17:9f
- structure and emphasis on contrast 17:5b

Exposition du système du monde (1796; "Exposition of the System of the World"), book by Pierre-Simon Laplace.

- planetary origin hypotheses 10:681b

Exposition Internationale des Arts Décoratifs et Industriels Modernes, international exhibition of decorative arts and architecture held in Paris in 1925. From its name was derived the term Art Deco (q.v.), a movement also known as *style moderne* that adapted design to the conditions of mass production. The exposition included many pavilions representing French colonies and foreign nations. It was attended by more than 16,000,000 visitors.

- Brandt ironwork display impact 11:1114f
- French industrial design 9:516c
- Le Corbusier's city planning 5:169a

Exposition Universelle (1900), international exposition held in Paris.

- Rodin exhibits 15:983a

ex post facto law, law that purports to make a crime of certain conduct that was not criminal when done, increases the punishment for crimes already committed, or changes the rules of procedure in force at the time an alleged crime was committed in a way substantially disadvantageous to the accused. The United States Constitution forbids Congress and the states to pass any ex post facto law. In 1798 it was settled that this prohibition applies only to criminal laws and is not a general restriction on retroactive legislation. Implicit in the prohibition is the notion that individuals be punished only in accordance with standards of conduct they might have ascertained before acting. The clause also serves, in conjunction with the bill-of-attainder clause, as another safeguard against the historic practice of passing laws to punish particular individuals because of their political beliefs. In 1867, in *Cummings v. Missouri* and *Ex parte Garland*, the loyalty test oaths passed after the U.S. Civil War to keep Confederate sympathizers from practicing certain professions, although not really criminal statutes, were condemned both as bills of attainder and as ex post facto laws.

The policies underlying ex post facto laws are recognized in most developed legal systems. They are reflected in the civil law maxim *nulla poena sine lege* ("no punishment without law"), a principle whose roots can be found in Roman law. In England, where Parliament is not prohibited from passing ex post facto laws, the judges, in accord with common-law tradition, have refused to interpret legislation retroactively unless Parliament has clearly expressed such an intention.

Prosecution of Nazi leaders following World War II for the crime of aggressive war (a crime specifically defined for the first time in the Allied charter creating the International Military Tribunal for war criminals) provoked extensive discussion over the scope and applicability of the principle against retroactive criminal laws.

- criminal law and principle of legality 5:276d

Expostulation with Inigo Jones, An (1613), poem by Ben Jonson.

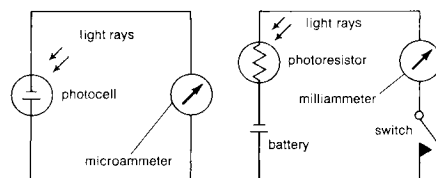
- masque text importance theme 10:268c

Expostulatio Spongiae (c. 1617), reply of Lope de Vega's friends to Luis de Góngora's literary attack *Spongia*.

- Lope de Vega's defense by friends 19:42d

exposure meter, photographic auxiliary device designed to measure light value and so guide lens-aperture setting. Early meters employed photochemicals, usually silver-chloride paper, that darkened on exposure to light. Later meters operated on optical or visual principles, such as comparisons of the brightness of the scene with a calibrated lamp the light of which could be varied.

Modern instruments are of two basic types: the self-generating, or photovoltaic; and the variable resistance, or photoconductive. The photovoltaic type, usually with a selenium element, converts the incoming light directly into an electrical current, the amount of which



Exposure meter circuits of the (left) photovoltaic and (right) photoconductive type

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depends on the amount of illumination. A sensitive microammeter measures this current and is calibrated to indicate the intensity of the light.

In the photoconductive type the element, usually cadmium sulfide, changes its resistance according to variations in the light intensity. By connecting a battery in the circuit, any change in resistance results in a change in current, measured by a milliammeter calibrated to read light intensity. The photoconductive type is far more sensitive and rugged than the photovoltaic type but requires a periodic battery change.

·camera light-metering systems 14:332f

·light measuring devices 10:965c

Expressen, a leading Swedish newspaper with the largest circulation (609,000) in Stockholm.

expression, musical, that element of musical performance which is something more than mere notes. Western music is notated on a system that specifies pitch and the relative lengths of notes. Factors such as speed or dynamics can be indicated only by words or abbreviations. Similarly, directions to the performer regarding technique, often with particular musical consequences, are mostly expressible by words. But the finer musical points are more difficult to indicate and must eventually stem from the performer himself or from a performance tradition with which he is familiar.

In European music before the 19th century, as in jazz and much non-Western music, the performer's responsibility included not only the nuances but also often the notes themselves. Thus, in much 17th- and 18th-century music the composer notated only the main structural notes of the solo part, leaving the performer to improvise ornamental figuration. He was expected to introduce specific ornaments, such as trills and slides, and in many cases to modify substantially the notated rhythm. Similarly, the accompanist, provided only with a thorough bass (*q.v.*), an accompaniment notated only as a bass melody line and figures signifying chords, was expected to supply the accompaniment in the correct style. Clues to this correct style ranged from the title of the piece, to the tempo indication, to the kinds of note values employed.

Instructions for the speed, or tempo, of a performance have the longest history. As early as the 9th century plainsong manuscripts had the signs "c" (*celeriter*, "quick") and "t" (*trahere*, "slow"), although such indications were exceptional, for the musical repertory was well-known to the performers, and written sources served purely for reference purposes. Only from the 16th century do frequent directions for tempo occur, mostly in collections containing a wide variety of musical forms and styles, such as the *vihuela* (guitar-shaped lute) publications of the Spaniard Luis Milán or the lute books of the German Hans Newsidler. Such early, often long-winded directions led to later, more methodical indications of tempo, achieved at first by defining the type of piece. Thus, "pavane" indicated a type of dance but also that the piece was to be played in a stately and subdued fashion. In the 18th century other dance titles, such as allemande, gavotte, and courante, gave precise information as to speed and style of performance. The 17th century saw the introduction of the Italian terms that have been in use ever since, often imprecise in meaning but running roughly hierarchically from slow to fast as follows: *adagissimo*, *adagio*, *lento*, *andante*, *andantino*, *allegretto*, *allegro*, *presto*, *prestissimo*.

Dynamics are expressed more simply and directly. The Venetian Giovanni Gabrieli (probably 1556-1612) introduced the words *piano* (soft) and *forte* (loud) into his scores; they became the basis of a system running from

pianissimo (*pp*) to *fortissimo* (*ff*), with softer and louder extensions possible. *Sforzato* (*sfz*) means a sudden sharp accent, and *sforzando* (*sf*), a slight modification of this. Increases and decreases in loudness are indicated graphically as \lessgtr and \gtrless but can also be written as *crescendo* (*cresc.*) and *diminuendo* (*dim.*).

More technical instructions, although often in Italian, frequently appear in some other language. These include directives for the insertion or removal of mutes (*con sordino*; *senza sordino*), the retuning of a string (*scordatura*), raising the bell of a wind instrument into the air (usually in German music, *Schalltrichter auf*), and other actions.

The expression of nuance and feeling is immensely difficult to indicate directly. *Mit Empfindung* ("sensibly"), *espressivo*, and *expressif* appear in abundance in late 19th-century scores and are usually self-explanatory. Although many composers, particularly in the 20th century, put indications of expression into their scores in their own languages, Italian remains the dominant language for such indications, if only because it has provided an international vocabulary taught to the musician along with the basic principles of notation.

·musical meaning and emotion 12:665a

Expressionism, in music, stylistic movement that includes intense extremes and contrasts, superabundant use of polyphony (*i.e.*, of simultaneous but independent musical lines), complex and perceptually difficult uses of tonality, atonality (avoidance of a tonal centre), and comprehensive but orderly transformations of musical themes and ideas.

More generally, musical Expressionism often involves intense emotional qualities, concern with detailed aspects of form, abstractionism, poetic and dramatic psychological conflicts, distortion, revolt, and radical usage of traditional musical resources and procedures. Some of these characteristics apply to the sound itself of Expressionistic music, others to its deeper bases or to its subject matter as revealed by the words used, as in opera and song.

The first modern use of the term Expressionism in a musical sense occurred c. 1910 as applied to certain German and Austrian composers. Today the roots of musical Expressionism of the 20th century are considered to reach back into the Romanticism of the 19th century and especially to compositions by Franz Liszt, Richard Wagner, Hugo Wolf, and Aleksandr Scriabin.

Some modern composers often considered Expressionistic include Gustav Mahler, Richard Strauss, Max Reger, Arnold Schoenberg, and Alban Berg.

The concept of musical Expressionism often overlaps other contemporary stylistic concepts, such as Neoromanticism and Impressionism (*q.v.*).

·music's ethical aspects 12:667a

·Romantic cast of orchestration 13:647a

Expressionist drama, which flourished in Germany between about 1910 and 1924, was characterized by its intensely subjective expression of the writer's deepest feelings (a quality that caused it to be described as *Seelendrama*, "drama of the soul"), usually through a leading character who acts as the dramatist-poet's alter ego; by its rebellious protest against the structure of society; and by its stress on language, often profoundly lyrical, at the expense of plot and psychologically drawn characters. The society against which the German Expressionists protested—and which was effectively destroyed by World War I—was based on a patriarchal family system, which tended to smother the development of youthful individuality. At a political level, the pattern manifested itself as rigid totalitarianism. Most Expressionist plays have a scene or scenes in which children assert their individuality by upbraiding their parents, often doing them violence, sometimes to the ex-

trêmes of rape and murder. The leading character (or author-hero) in an Expressionist play often pours out his soul in long monologues, usually couched in an elliptical language that is not so much framed to carry statements as to permit what is called the Expressionist *Schrei* (scream) to be heard. Secondary characters are seldom more than puppet figures—representatives of the family or of those who conform to the ideals of society.

The German Expressionist playwrights included Carl Sternheim, Ernst Toller, Georg Kaiser, Reinhard Sorge, Walter Hasenclever, Reinhard Goering, and Fritz von Unruh. Outside Germany, playwrights who made use of Expressionist dramatic techniques included, in the U.S., Eugene O'Neill (*The Emperor Jones*; *The Hairy Ape*) and Elmer Rice (*The Adding Machine*); the English poetic dramatists Ronald Duncan (*This Way to the Tomb*) and W.H. Auden and Christopher Isherwood (*The Ascent of F 6*; *The Dog Beneath the Skin*); and the Irish dramatist Sean O'Casey (*The Silver Tassie*).

Linguistically, German Expressionist drama was heavily influenced by August Stramm, a poet killed in World War I, who had experimented with language, cutting it to the bone and forcing monosyllabic utterance to act as a barometer of feeling and emotion. The German playwrights, though they did not use language as radically as Stramm had done, like him avoided descriptive analysis of emotion or situation. Expressionist drama is therefore essentially different from the Naturalistic drama of such playwrights as the Norwegian Henrik Ibsen. Both kinds were critical of society, but whereas the Naturalist playwrights had pointed to specific ills and had suggested specific cures, the Expressionists cried out against the evil of society in general and, with a kind of desperate optimism, called for the spiritual rebirth of the "new man."

Dramatic antecedents of Expressionism included the later work of the Swedish playwright August Strindberg, especially his *Dream Play*, with its device of presenting the drama from the point of view of one central character; and the play *Frühlings Erwachen* (1891; Eng. trans., *Spring's Awakening*, 1909) by the German Frank Wedekind. The latter influenced Expressionism thematically, through his attacks on the family, and linguistically, through his use of heightened speech.

The decline of Expressionism was hastened by the vagueness of its longings for a better world, and the movement lost impetus in the disillusioned society of the mid-1920s. Expressionist techniques continued to be used, however, though plays, especially those by Ernst Toller, began to take a less self-absorbed view of man in society. Spectacular staging became a feature of production, particularly in the work of such exuberant directors as Erwin Piscator and Leopold Jessner. Dramatic experimentation in form and technique in Germany culminated in the socially committed epic theatre evolved by Bertolt Brecht from the late 1920s onward.

·Strindberg's influence on drama 17:738d

·theatrical techniques and goals 18:229d

expression marks, in music, the indications provided by the composer as an aid to the accurate interpretation of his text. *See* expression, musical.

·notational symbols for performance 12:733g

Expression of the Emotions in Man and Animals, *The* (1872), pioneer work by the evolutionist Charles Darwin, in which he applied his theories to an area of animal behaviour.

·Darwin's theories on evolution 5:494e

·evolution of emotion 6:757h

expressway, 20th-century innovation designed to move large masses of automobiles quickly through an urban area. City planners attempt to plan the layout and location to accommodate population centres or industrial complexes. When an expressway is built on



Aerial view of a cloverleaf interchange on a Los Angeles expressway
Union Pacific Railroad Photo

the right of way of an existing road, it can move traffic easily and be visually pleasing as well. Lake Shore Drive in Chicago is an example of this type, though its prohibition of truck traffic and its stoplights are no longer characteristic of expressways.

- Belgium recent construction 2:822d
- California expanse and beginning 3:617h
- design considerations and engineering 15:902b
- modernization and construction 18:656h
- road history, building, and operation 15:892b
- urban use and construction problems 18:659a
- U.S. road construction history 15:900d *passim* to 901g

Express Wieczorny, most popular evening newspaper in Poland; published in Warsaw, its circulation is 500,000.

expropriation (property law): *see* confiscation and expropriation.

exsolution, phenomenon displayed by some mineral solid solutions that separate into component minerals when they cool below the temperature of mutual solubility or stability of the solid solution. The term unmixing also applies to this phenomenon and includes liquid solutions that are unstable and thus separate, or unmix, below a certain temperature. For example, the sodium-rich feldspar molecule (albite, $\text{NaAlSi}_3\text{O}_8$) and the potassium-rich feldspar molecule (anorthite, KAlSi_3O_8) may exist in a single crystal above 650°C ($1,200^\circ\text{F}$), but below 650°C , at a temperature depending on the composition of the solid solution, the solid solution is unstable, and exsolution or unmixing will occur if the temperature remains high enough for a long enough time to allow solid-state diffusion reactions to occur. Unmixed phases can be observed microscopically as tiny lamellae or intergrowths of both the sodium-rich and the potassium-rich feldspars in perthite. *See also* perthite.

- alkali feldspar crystallization 7:214b
- ore deposit formation temperature 13:667a

Exsurge Domine ("Lord Cast Out"), bull issued by Pope Leo X in 1520 condemning 41 of Luther's theses as heretical.

- papal renunciation of Luther's Theses 11:192b

extemporization (music): *see* improvisation.

extended family, an expansion of the nuclear family (parents and dependent children), usually built around a unilineal descent group (*i.e.*, a group descended from one side only of a family). The extended family system often, but not exclusively, occurs in regions in which economic conditions make it difficult for the nuclear family to achieve self-sufficiency. Cooperation being necessary, aid is recruited,

usually either from the patrilineal kin or the matrilineal kin. In traditional China, for example, the extended family ideally consisted of the nuclear family of the head of the household, his unmarried daughters, his sons and their families, his sons' sons' families and unmarried daughters, and so forth. The extended family may include more distant kin, but the uncles, aunts, or cousins usually belong to the same clan as members of the core lineage.

The relationships between members of the extended family are such that the form of address a person employs consists of an extension of nuclear family terms to a wider circle of relatives within the resident clan. In a matrilineal family, for example, a person might refer to his maternal uncle as "father" and to the latter's children as "brothers" and "sisters." The extended family does not necessarily live in the same dwelling, but normally the members live close together and work in teams.

It is common for the senior kin to assume the role of mate selection for those of marriageable age, who are considered too inexperienced to make a proper choice. Qualities sought in a spouse by the interested kin in an extended family include work ability, capacity to adapt, procreative power, status, and financial worth. *Major ref.* 7:155c

- Arab social structure 11:574h
- Bangladesh kinship organization 17:127h
- Central Asian kin-communities 3:1120g
- East Asian kinship patterns 6:124a *passim* to 126e
- Eskimo resident family loyalty 19:789f
- Meso-America's basic social unit 11:955b
- Micronesian kinship patterns 12:123c
- Navajo and Pueblo social structure 17:307b
- North American Plateau Indian practices 13:228f
- Polynesian kinship patterns 14:781g
- rural societies' family structure 16:29

extender, a substance, usually inert, that is added to a product such as paint as a diluent, modifier, or adulterant.

- paint manufacture uses 13:889e
- paint technology development 4:132h

extension (logic): *see* intension and extension.

extension, of a function f , is any function g the domain of which contains the domain of f , and for which $g(x) = f(x)$ for every x in the domain of f .

extensionality, axiom of, in set theory, axiom that for any two sets a and b , if for all c , c is a member of a if and only if c is a member of b , then a is identical with b .

- class identity as membership function 11:53c

extension theorem, theorem from measure theory stating that a measure defined on a field of sets can be extended to a measure on the sigma-field generated by the original field and that under certain conditions this extension is unique. The theorem is used to extend the notion of probability measure to infinite dimensional spaces.

- probability theory and method 14:1110d

extensive and intensive properties, distinction made in thermodynamics between properties that are related to the quantity of matter under consideration (extensive) and those that are independent of the quantity of matter (intensive). Examples of the former include volume and heat capacity, whereas temperature, pressure, and concentration of a solution are intensive properties.

- physical theory formulations 14:404g
- thermodynamics concepts and laws 18:292h

extensometer, an instrument for measuring small deformations of test materials under stress.

- static tension testing 11:627b; *illus.*

extensor muscles, muscles that increase the angle between members of a limb (*cf.* flexor muscles), as by straightening the elbow or knee or bending the wrist or spine backward. The movement is usually directed backward, with the notable exception of the knee joint. In man, certain muscles of the hand and foot are named for this function. In the hand these include the extensor carpi radialis brevis, extensor carpi radialis longus, and extensor carpi ulnaris, which run from the humerus (bone of the upper arm) along the back of the forearm to the metacarpal bones at the back of the hand and extend the wrist; the extensor digitorum, which runs from the humerus to a common tendon attached to all of the fingers and extends the fingers; the extensor indicis, which acts upon the index finger; and the extensor pollicis brevis and extensor pollicis longus, which run from the radius and ulna (bones of the forearm), respectively, and act upon the thumb.

Extensors in the foot include the extensor digitorum longus and extensor digitorum brevis, which originate at the upper and lower parts of the lower leg and act through long tendons upon the toes, and the extensor hallucis brevis and extensor hallucis longus, which act upon the great toe. The longus muscles of the foot also aid upward flexion of the foot at the ankle.

extenuating circumstances, circumstances that diminish the culpability of one who has committed a criminal offense and so can be considered to mitigate the punishment.

Many Anglo-American legal systems do not prescribe minimum punishments for all crimes. The judge is thus free to consider all the circumstances in setting the punishment up to a prescribed maximum. Some special circumstances automatically reduce an offense to one of lesser degree; for example, provocation of the accused by the victim reduces first-degree murder to manslaughter or second-degree murder. In England, the jury may reduce a charge of murder to manslaughter if the accused is found to be suffering diminished responsibility (distinguished from insanity, which permits acquittal).

Civil-law countries make much more use of prescribed minimum sentences for crime and consequently have had to develop more formal doctrines of extenuating circumstances. The Italian penal code gives a list of extenuating circumstances, such as that the accused acted from motives of honour, that he committed the offense in a state of intense emotion caused by grave misfortune, or that before the trial he repaired the injury by giving compensation. The French and Japanese penal codes provide for reduction of punishment accord-

ing to a prescribed scale when the jury or court finds extenuating circumstances.

exterior algebra, or GRASSMANN ALGEBRA, in linear and multilinear algebra, of a vector space V , the homomorphic image (see homomorphism) of the tensor algebra ($q.v.$) T that is obtained by setting the tensor product ($q.v.$) $a \times b$ equal to $-b \times a$ when a and b are elements of V . When this equality is assumed, all homogeneous elements of degree $n+1$ or more are forced to be zero so that if V is n -dimensional, the exterior algebra of V has finite dimension, 2^n ; this algebra was first introduced by the German mathematician Hermann Günther Grassmann in 1844 for geometric purposes and was generalized by the Clifford algebra. *See also* Clifford algebra.
·topological group theory 18:494b

exterior ballistics, the subdivision of the science of ballistics concerned with the flight of projectiles through the atmosphere.
·principle, laws, and applications 2:657a

Exterminator, popularly known as OLD BONES (1915-45), U.S. Thoroughbred, a dependable and durable race horse who won 50 of 100 races in eight seasons. Because of the length of his career and his extraordinary ability to win sprints and long-distance races under heavy weights, some horsemen considered him superior to Man o' War, his greatest contemporary and doubtless the fastest U.S. horse of the time. (The two never raced against each other.) A chestnut gelding sired by McGee (an English-bred stallion) out of Fair Empress and foaled in Kentucky, Exterminator raced with little success as a 2-year-old, but in 1918 he won the Kentucky Derby. In 19 of his victories he carried at least 130 pounds. He finished second and third 17 times each.

external auditory canal, passageway that leads from the outside of the head to the tympanic membrane, or eardrum membrane, of each ear. The structure of the external auditory canal is the same in all mammals. In appearance it is a slightly curved tube that extends inward from the floor of the auricle, or protruding portion of the outer ear, and ends blindly at the eardrum membrane, which separates it from the middle ear. The outside third of the canal wall consists of cartilage while the inner two-thirds of the wall are made of bone. The canal is nearly 1 inch (2.5 centimetres) in length and is lined with skin that extends to cover the tympanic membrane. Tiny hairs directed outward and modified sweat glands that produce cerumen (earwax) help to discourage insects from entering the ear.

·ear origins from branchial arches 6:751e
·structure and function in human ear 5:1120h; illus.

external-combustion engine, a heat engine that operates on heat produced outside the engine cylinder.

·internal-combustion engine
·comparison 7:930c

external ear, that part of the vertebrate ear external to the ear drum (tympanum). It includes the pinna, or visible part of the ear, and the outer ear passage.

·cranial nerve distribution 12:1019c; illus. 1017
·disease symptoms and treatments 5:1133e
·evolution, embryology, anatomy, and function 5:1132a
·human embryonic origins 6:747f; illus.
·reptile, bird, and mammal forms 17:45e
·structure and function in man 5:1120h; illus.

external genitalia, the female clitoris and pudendum, or the male penis and scrotum.
·human embryology and adult anatomy 15:690d; illus. 691

externality, economic, term used to describe the social costs or benefits of an eco-

nomic activity as distinguished from its private costs or benefits as measured within the price system.

Two types may be considered: direct and pecuniary externalities. Direct externalities arise as an immediate result of the productive activity of a firm or industry. Air and water pollution are prominent examples of direct diseconomies. Common direct external economies include the beneficial effects to a community of a new dam or an individual's education. In the first case, the cost of using the air and water resources is not paid by either producers or consumers; in the second, no charge is made to the community for extra benefits received.

Pecuniary economies and diseconomies result from the operation of the price system and consist of price increases or decreases to other firms or industries. For example, the expansion of an electric power plant's scale of operation may decrease its production costs; if this is passed on to power users in the form of lower prices, pecuniary external economies result. A pecuniary diseconomy may occur if the expansion of a firm, including an enlargement in its labour force, results in the bidding up of wages for a certain type of labour.

external oblique abdominis muscle: *see* abdominis muscles.

external-shoe brake, a type of brake that operates by pressure applied by the shoe to the outside of the brake drum.

·design and application 11:248f; illus.

exteroceptor (biology): *see* receptor.

exterritoriality: *see* diplomatic immunity.

Ext functor, a derived functor.

·algebraic structure theory 1:552b

extinction, in biology, the dying out or termination of a race or species of animals or plants. Evolutionary changes have been responsible for the extinction of forms such as the dinosaurs and mammoths that were unable to adapt to changes in their environment. Other animals have been exterminated by slaughter or encroachment on their territories by man.

·ammonite die-offs and resurgences 7:562c
·artiodactyl environmental influences 2:71h
·asexual reproduction vulnerabilities 16:585f
·passim to 586h
·biogeographic regions' climates and other causal factors 2:1001c
·biotic interactions and natural balance 2:1046f
·carnivore population vulnerability 3:928a
·competitive displacement of fish groups 7:336g
·crocodilian population reductions 5:287d
·dinosaur disappearance 7:571f
·elephant and mammoth decline 15:1f
·elephant seal and blue whale decimation 1:959h
·endangered sloth and armadillos 6:299b
·endangered species of furbearers 7:812d
·explanations and problems 7:576f
·food chain breaks, restoration conditions, and hunting 5:40h *passim* to 42g
·great auk exploitation by man 4:33g
·gruiform locomotion disadvantages 8:447b
·human restrictions on species survival 5:916a
·hunting effect on game supply 9:49a
·introduced predators of solenodons 9:624h
·Late Permian-Triassic fossil record 18:695a
·lungfish features and fossil record 5:813f
·marsupial population influences 11:538a
·Neanderthal problem possibilities 11:427c
·overspecialization and re-adaptation 7:16a
·passenger pigeon exploitation 4:932e
·passerine feather exploitation 13:1052h
·Pleistocene climate and human factors 14:569c
·Sirenia exploitation by man 16:810g
·Steller's sea cow extirpation 11:402f
·tuatara vulnerability to predators 15:824e
·Upper Paleozoic marine life 13:927a
·U.S. geographic faunal changes 18:918f
·waterfowl population decrease 1:939e
·whale exploitation and control 19:805h
·zoo's role in species preservation 19:1161f

extinguisher moss, common name for plants of the genus *Encalypta* (order Bryales), which form large tufts on limestone rocks, ledges, and walls. About eight species are native to North America. They are usually one to three centimetres ($\frac{1}{2}$ to $1\frac{1}{2}$ inches) tall, with erect capsules (spore cases) borne on setae (stalks) about five to ten millimetres ($\frac{1}{2}$ to $\frac{3}{8}$ inches) long. The calyptra (hoodlike covering) of each capsule resembles a candle snuffer, or extinguisher, and extends below the capsule; in *E. ciliata* the calyptra is fringed.

extirpative surgery, complete removal of a part of the body.

·cancer treatment 17:820a

extortion (law): *see* bribery and extortion.

extracalation (calendar): *see* intercalation.

extracellular digestion, digestion occurring outside cells.

·nutrient intake mechanisms 5:781c

extracellular fluid, in biology, body fluid that is not contained in cells. It is found in blood, lymph, body cavities lined with serous (moisture-exuding) membrane, the cavities and channels of the brain and spinal cord, and the muscular and other body tissues. It differs from intracellular fluid (fluid within the cells) in that it generally has a high concentration of sodium and low concentration of potassium, while intracellular fluid is high in potassium and low in sodium.

·disease causes and internal balance 5:843e; table

·edema caused by renal disease 7:55d
·human water and salt balance 7:429d; table
·kidney function influences of ADH 7:43c

extract, in foods, a solution in alcohol of flavouring ingredients.

·use and preparation from essential oil 17:507e

Extract from Captain Stormfield's Visit to Heaven (1909), book by Mark Twain.

·Mark Twain's philosophy 18:807e

extraction, in chemistry, separation of the components of a mixture by treatment with a liquid in which some of the components dissolve.

·chemical analysis separation methods 4:79b
·chromatography separation principles 4:159b
·essential oil extraction 13:534h
·nickel purification from laterite 13:72e
·oil production processes 13:528e
·petroleum refining processes 14:182c
·silver production processes 16:777a
·solubility and chemical separation 16:1047f
·soybean protein extraction 7:481g

extract printing: *see* discharge printing.

extradimensional shift, experimental learning problem in which the subject learns to discriminate objects along one dimension (e.g., colour) and then must learn to discriminate the same objects along another dimension (e.g., shape).

·concept learning measurement techniques 4:1063b

·transfer of training and aging 18:599e

extradition, process by which one state, upon the request of another, surrenders a person for trial and punishment for a crime punishable by the laws of the requesting state and committed outside the requested state. This request by the receiving state differentiates extradition from other measures for the forcible removal of undesirable persons, such as banishment, expulsion, and deportation.

Extradition owes its existence to the principle of territoriality of criminal law, according to which a state does not apply its penal statutes to acts committed outside its own boundaries except in the protection of special national interests. In view of the solidarity of nations in the repression of criminality, however, states are usually willing to cooperate in bringing a perpetrator to justice lest he go unpunished.

Extradition is regulated within countries by

extradition acts and between countries by diplomatic treaties. Belgium passed the first act in 1833. The purpose of such acts is to specify extraditable crimes, clarify the procedures and safeguards used to extradite, and stipulate the relationship between the act and international treaties.

The laws of the various nations differ greatly as to the relationship between acts and treaties. In the United States, extradition must fall under the provisions of a treaty as long as Congress has not legislated to the contrary. This is also the case in England, Belgium, and The Netherlands. On the other hand, the French extradition act has application on its own terms, in the absence of a treaty or in matters not regulated in the treaties. Germany and Switzerland extradite apart from a formal convention so long as their governments and the requesting state have exchanged declarations of reciprocity. In general, the majority of nations grant extradition even in the absence of binding international obligations.

Although the conditions of extradition vary greatly, some principles are common to many countries. Most states decline any obligation to surrender their own nationals. West Germany, The Netherlands, Belgium, France, and Switzerland prohibit such extradition. In Argentina, England, and the United States, nationals may be extradited only if the governing treaty authorizes it.

Another common principle is that of double criminality, under which extradition will be barred unless it is for an offense punishable in the surrendering state. Countries also generally recognize the right of asylum for political offenders. The characterization of an offense as political, however, is subject to widely divergent definitions.

Under the principle of speciality, surrender is made on condition that the requesting state not convict or punish the individual for any crime different from that for which he was extradited. This protection may be waived by the extraditing state.

·criminal law jurisdiction 5:276h
·international law principles 9:749e

extradural hemorrhage, bleeding into the space between the skull and the dura mater covering the brain.

·causation, course, and treatment 12:1054h

extra-embryonic membrane, membrane outside the embryo proper.

·formation and functions 5:629b; illus.

extraocular muscles, six muscles that, by their contraction, pivot the eyeball so as to direct the gaze.

·distance perception role 17:379g
·human cranial nerve distributions 12:1018e; illus. 1017
·structure and function in humans 7:93b; illus.

extraordinary ray (optics): *see* refraction, double.

extrapyramidal system, part of the human central nervous system situated outside the pyramidal tract (a bundle of motor nerve fibres) in the brainstem.

·anatomic relationships and functions 12:1005c; illus.

extrasensory perception (ESP), perception that occurs independently of the known sensory processes. Usually included in this category of phenomena are telepathy, or thought transference between persons; clairvoyance, or supernormal awareness of objects or events not necessarily known to others; and precognition, or knowledge of the future. Scientific investigation of these and similar phenomena dates from the late 19th century, with most supporting evidence coming from experiments involving card guessing. A special deck is used consisting of five sets of five cards, each marked with one symbol in the form of a cross, circle, star, square, or wavy lines. Subjects attempt to guess correctly the symbols of

cards hidden from their view under controlled conditions; a better-than-chance percentage of correct calls on a statistically significant number of trials is considered to be evidence of ESP. Although many experiments have yielded apparently positive results, the majority of scientists continue to doubt the existence of ESP. *Major ref.* 13:1002a

·philosophic impact of Marcel's probing 11:488g

extrasystole, a premature contraction of the heart, causing a momentary interruption of the rhythm of the heart beats.

·causation and significance 3:893b

extraterrestrial life: *see* exobiology.

extraterritoriality: *see* diplomatic immunity.

extratropical cyclone, or WAVE CYCLONE, storm system formed in middle and high latitudes, in regions of large horizontal temperature variations called frontal zones. Extratropical cyclones present a contrast to the more violent cyclones or hurricanes of the tropics, which form in regions of relatively uniform temperatures.

According to the polar-front theory, extratropical cyclones develop when a wave forms on a frontal surface separating a warm from a cold air mass. As the amplitude of the wave increases, the pressure at the centre of disturbance falls, eventually intensifying to the point at which a closed cyclonic circulation begins. Further amplification of the wave results in continued intensification of the cyclone. The ultimate decay of such a system results when the cold air from the north in the Northern Hemisphere, or from the south in the Southern Hemisphere, on the western side of such a cyclone sweeps under all of the warm tropical air of the system so that the entire cyclone is composed of the cold air mass. This action is known as occlusion.

Typical weather sequences are associated with extratropical cyclones. Stations ahead of the approaching front side of the wave, called the warm front, normally experience increasingly thickening and lowering clouds, followed by precipitation, which normally persists until the centre of the cyclone passes by the station. If the station is located far to the south of the cyclone centre, then usually only a relatively short period of precipitation occurs during the passage of the back side of the wave, called the cold front. In middle latitudes, many extratropical cyclones normally exist around the globe at any given time. These storms tend to form in preferred locations and follow typical paths, although exceptions to these typical patterns often occur.

extrauterine pregnancy: *see* ectopic pregnancy.

extravert (behavioral sciences): *see* extrovert.

Extremadura, or ESTREMADURA, region of western Spain comprising the modern provinces of Cáceres and Badajoz. The name was given during static periods of the Christian Reconquest of the Iberian Peninsula to whatever then happened to be the zones bordering on Moorish territory.

Thus in the 10th and 11th centuries the border approximated to the line of the Duero River from Soria in the east to the Atlantic coast near Coimbra in modern Portugal. Then, during the reign of Alfonso VI of Leon and Castile, the name Extremadura was transferred (c. 1086) to a newly conquered region to the south, which included Salamanca, Segovia, and Avila. This, at first, was described as "Extremadura beyond the Duero" to distinguish it from the older region of the same name. Leon, following its southern expansion between 1157 and 1230, also had a province called Extremadura, which stretched southward from Ciudad Rodrigo to beyond Badajoz. In the 12th and early 13th centuries,

therefore, both Leon and Castile had Extremaduran provinces, administered as separate entities by each kingdom. Later, in the reign of Ferdinand III of Castile and Leon, this separate administration was abandoned, and from the later Middle Ages the term was applied to a region only slightly larger than the combined area of the two modern provinces. Pop. (1976 est.) 1,020,282.

·de Soto's background and related fame 17:18c
·economy, area, and population 17:391a; table 389
·map, Spain 17:382

extreme point, element of a convex set that does not lie on a line joining two other points of the set.

·optimization theory and method 13:630b

extreme unction (Christian sacrament): *see* anointing of the sick.

extrinsic factor (nutrition): *see* vitamin B₁₂.

extrinsicism, in philosophy or theology or both, the tendency to place major emphasis on external matters rather than on more profound realities. In terms of morals and ethics, it tends to stress the external observance of laws and precepts, with lesser concern for the ultimate principles underlying moral conduct.

In Christian thought, for example, this is illustrated by the tendency to define the church in terms of such exterior elements as its social structure, rituals, and the obligations it imposes on the faithful, rather than to view it as an essentially spiritual entity. Historically, extrinsicism has been an especially important factor in disputes over the nature of supernatural grace. Roman Catholic doctrine holds that grace effects an interior transformation, in opposition to the 5th-century Pelagian heresy, which emphasized salvation by works alone, and the teaching of those Reformers who saw grace as a totally extrinsic acceptance of the sinner by God.

extrovert, or EXTRAVERT, personality type, according to theories of the Swiss psychiatrist Carl Jung, characterized by outgoingness in attention and interest, responsiveness to external stimuli (especially other persons), and impulsiveness; the opposite of introvert (*q.v.*). An extreme extrovert may become aggressive and overdependent on group acceptance, losing independence in actions and thoughts. Subsequent research has placed most persons between Jung's two types—i.e., no one can be accurately described as wholly extrovert or introvert.

·diagnostic testing 14:111f

extrusion, forcing a material through a die (*q.v.*) to give it the desired shape or characteristics. Many materials can be extruded: many metals and alloys, plastics, and clay products (before firing).

·industrial ceramics production 3:1155g
·metal processing methods 11:1073c
·plastic processing techniques and apparatus 14:519e; illus.
·processing of metal rods and tubes 11:620e
·rope and cable manufacturing processes 15:1146a
·synthetic fibre spinning processes 7:258g

extrusion coating, industrial process for applying polyethylene plastic coatings to papers, machinery, process, and advantages 13:974d

extrusive (VOLCANIC, EFFUSIVE) **rock**, any rock derived from magmatic material poured out or ejected at the surface of the Earth; these rocks are distinct from intrusive rocks, which have been emplaced at depth in the Earth's crust. Both lava flows and pyroclastic rocks are extrusive; they are commonly glassy or finely crystalline. Most extrusive rocks have an intrusive mineralogical or chemical equivalent from which they differ mainly in their degrees of crystallinity. Rock classifica-