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habitat. The immediate surroundings (living place) of a plant or animal; everything necessary to life in a particular location except the organism itself^[23].

hade. The angle of inclination of a fault (or joint) plane measured relative to the vertical^[9]. See also dip.

Halbhöhle. (German.) See rock shelter.

Halbkugelkarst. (German.) Tropical karst topography containing dome-shaped residual hills surrounding depressions, a kind of *Kegelkarst*. Also called *Kugelkarst*^[10].

half-exposed karren. These are patches of soil on otherwise bare limestone that attack the rock by means of biogenic CO₂^[3].

half-blind valley. Blind valley in which the stream overflows in floodtime when the swallow hole can not accept all the water^[10].

half tube; half-tube. 1. An inverted channel with semi-circular cross section seen in cave-passage ceilings, most clearly where the ceiling is an uneroded bedding surface. The half tube originates as part of a phreatic tube guided by the bedding plane, and the lower half is subsequently removed by vadose enlargement. The presence of half tubes provides important evidence of early phreatic-cave development^[9]. 2. Trace of

a tube remaining in the roof or wall of a cave^[10]. See also tube.

Hagen-Poiseuille equation. The equation used to define the laminar flow of water in either fractures or tubes and is given as

$$Q = - \frac{w^3 b \gamma dh}{12\mu dL}$$

for laminar flow in fractures

and

$$Q = - \frac{\pi r^4 \gamma dh}{8\mu dL}$$

for laminar flow in tubes

which states that the average volumetric discharge of flow through either type of opening is directly proportional to the type, shape, and dimensions of a particular pore and the hydraulic gradient^[5]. Note: Q =discharge, w =width of the fissure, b =open portion of the long dimension of the fissure, r =radius of the tube, γ and μ are the specific weight and dynamic viscosity of water respectively, dh/dL =gradient, and a minus sign is attached to the equations to indicate that flow occurs in the direction of decreasing hydraulic head.

halite. The mineral form of sodium chloride (NaCl), or rock salt. Halite occurs, sometimes to considerable thicknesses, in many buried-rock successions, from which it has been extracted both by mining and by redissolving it in water pumped from and back to the surface. The existence of brine springs indicates that natural water movement occurs

through buried halite sequences, presumably through voids that could be thought of as caves. Although distinctive halite (or salt) karst features are known in some arid areas, a range of features analogous to those found on karstic rocks such as limestone are unlikely to form, and less likely to be preserved, due to halite's relative weakness and very high solubility. In Britain expressions of salt karstification are limited to relatively subdued surface features. The "flashes" of the Cheshire area, are hollows, sometimes transformed into water-filled meres, formed by subsidence of overlying rocks and superficial deposits where salt has been dissolved from buried halite beds of Triassic age^[9].

hall. In a cave, a lofty chamber which is much longer than it is wide^[10]. See also gallery.

halocline. A locally steep salinity gradient along the interface between fresh ground-water and saline ground-water, such as is found at the base of the freshwater lens common beneath many limestone islands in the tropics. Water mixing and microbial activity are important influences on dissolution along the halocline, as shown for instance in blue holes^[9].

halomorphic soil. Saline and alkali soils.

hanging blade. A blade projecting down from the ceiling^[10]. See also blade.

hannayite. A cave mineral — $(\text{NH}_4)_2\text{Mg}_3\text{H}_4(\text{PO}_4)_4 \cdot 8\text{H}_2\text{O}$ ^[11].

hardening. The process of induration^[16].

hardness. 1. Property of water that prevents lathering because of the presence of cations, mainly calcium and magnesium, which form insoluble soaps^[10]. 2. The sum of calcium and magnesium ions expressed as the equivalent amount of calcium carbonate (CaCO_3)^[16]. 3. The property to form insoluble salts of fatty acid (soap)^[16].

hardpan. This develops when there are secondary calcium carbonate cementations in the lower part of the soil profile^[16]. Synonym: mortar bed. See also caliche; havara; nari.

harness. An arrangement of tape for attaching the lower body (seat harness) or the upper (chest harness) to ascenders or descenders^[25].

havara. Name given in Cyprus to a soft porous carbonate formation, up to several meters thick, found capping many formations and containing fragments and minerals derived from older rocks; it is probably a type of hardpan or caliche^[20]. See also caliche; karkalla.

haystack hill. (Puerto Rican.) In the tropics, rounded conical hill of limestone developed as a result of solution. Term replaced by mogote^[10]. Synonyms: (French.) *mogote*; (German.) *Mogote*; (Italian.) *mogote*, *rilievo carsico residuo*; (Spanish.) *mogote*; (Turkish.) *konik kireçtaşı tepesi*; (Yugoslavian.) *hum*. See also mogote.

head. The energy contained in a water mass, produced by elevation, pressure, or velocity^[6].

head loss. That part of head energy which is lost because of friction as water flows^[6].

head, static. The height above a standard datum of the surface of a column of water (or other liquid) that can be supported by the static pressure at a given point. The static head is the sum of the elevation head and the pressure head^[22].

head, total. The total head of a liquid at a given point is the sum of three components: (a) the elevation head, which is equal to the elevation of the point above a datum, (b) the pressure head, which is the height of a column of static water that can be supported by the static pressure at the point, and (c) the velocity head, which is the height to which the kinetic energy of the liquid is capable of lifting the liquid^[22].

head water. The upper reach of a stream^[16].

heat of condensation. The heat released in transforming a substance from its vapor to its liquid state^[16].

heat of vaporization. The heat necessary to change water from the liquid to the gaseous state^[16].

heel-print karren. See Trittkarren.

helictite. 1. Generally small variety of stalactitic calcite growth that is twisted and contorted with no apparent regard for gravity. Helictites form on cave walls, ceilings, and on stalactites. The growth develops as seepage water loses carbon dioxide from near its tip, having been supplied to that point by capillary action through a fine central canal. The helictite

shape is created by crystal lattice distortion and crystal form changes within the calcite, but what causes these is uncertain. Impurities may play a role, and rare groups of parallel growing helictites may be wind-guided^[9]. 2. Irregular, twig-like, crystalline growths with varying orientations but often in crystal continuity, formed in caves by precipitation from bicarbonate solutions^[20]. 3. A curved or angular twiglike lateral projection of calcium carbonate having a tiny central canal, found in caves^[10]. Also known as eccentric anemolite^[20]; eccentric stalactite. Synonyms: (French.) *excentrique*; (German.) *exzentrisch gekrümmter, Tropfstein, Excentriques*; (Greek.) *stalaktits akanonistos*; (Italian.) *stalattiti anomale, eccentriche*; (Spanish.) *estalactita excentrica*; (Turkish.) *düzensiz sarkıt*; (Yugoslavian.) *heliktit*. Related to curtain, dripstone, speleothem.

heligmite. An eccentric growing upward from a cave floor or from a shelf in a cave. A curved or angular thin stalagmite^[10].

helmet. A miner's, climber's or other kind of non-metallic, protective helmet used in caving.

hematite. A cave mineral — Fe_2O_3 ^[11].

hemimorphite. A cave mineral — $\text{Zn}_4\text{Si}_2\text{O}_7(\text{OH})_2 \cdot \text{H}_2\text{O}$ ^[11].

herbivore. An animal that eats plants, thus making the energy stored in plants available to carnivores^[23]. See also *carnivore*; *insectivore*; *omnivore*.

heterogeneity. A characteristic of a medium in which material properties vary from point to point^[22].

heterogeneous. The unequal spacial distribution of aquifer properties^[16].

hexahydrate. A cave mineral —
 $\text{MgSO}_4 \cdot 6\text{H}_2\text{O}$ ^[11].

hibbenite. A cave mineral —
 $\text{Zn}_7(\text{PO}_4)_4(\text{OH})_2 \cdot 7\text{H}_2\text{O}$ ^[11].

hibernation. A prolonged dormancy or sleeplike state in which animal body processes such as heartbeat and breathing slow down drastically and the animal neither eats nor drinks. Nearly all cold-blooded animals and a few warm-blooded animals hibernate during the winter in cold climates. Extremely large aggregations of bats, crickets, and spiders hibernate in some caves^[23].

histo, histoplasmosis. The disease caused by the fungus *Histoplasma capsulatum*, found in bird and bat guano, especially in the southern USA and the tropics. An occupational disease of cavers, aviary and poultry workers, guano miners, and maintenance workers. Infection is usually caused by breathing the microscopic spores, which infect the lungs, or sometimes the eye. Flu-like symptoms accompanied by low-grade fever, breathing difficulties and pain, and miasma may start about 14 days after exposure and continue for weeks, months, or rarely until death, usually from complications. Treatable with various anti-fungals, such as itroconazole. Often misdiagnosed, as the standard tests may give a false negative^[23].

hod. See aisle.

holokarst. 1. Karst area with little or no surface runoff or streams; it is underlain by thick carbonate rocks and is characterized by well developed karst surface topography from karren to poljes, extensive subsurface karst features like caves, caverns, galleries, chimneys, etc^[20]. 2. Cvijić's term for a karst area like that of the Dinaric Karst of Slovenia. Such areas have bare surfaces on thick deposits of limestone that extend below sea level, well developed karren, dolines, uvalas, poljes, deep ponors, and extensive cave systems; they have little or no surface drainage^[10]. Synonyms: (French.) *holokarst*; (German.) *Holokarst*; (Greek.) *holokarst*; (Italian.) *olocarsismo*, *carsismo*, *maturo*; (Spanish.) *holokarst*; (Turkish.) *tam karst*; (Yugoslavian.) *potpuni kŕs(kras)*, *holokarst*. Contrast *causse*, *merokarst*.

homogeneity. A characteristic of a medium in which material properties are identical everywhere^[22].

homogeneous. The even spacial distribution of aquifer properties^[16].

homogeneous fluid. A fluid that occurs in a single phase^[16].

hook gage. A gage for the precise position measurement of liquid levels^[16].

hopeite. A cave mineral —
 $\text{Zn}_3(\text{PO}_4)_2 \cdot 4\text{H}_2\text{O}$ ^[11].

horizontal angle. The difference in direction of two survey lines measured clockwise in a horizontal plane^[25].

horst. A block having been uplifted along its boundary faults^[16].

Horton number. Expresses the relative intensity of erosion process in a drainage basin^[16].

hot-seat rappel. A method of rappelling in a cave with the rope running under one leg, up across the opposite shoulder and controlled with a hand. The friction of the rope on the body creates a lot of heat, hence its name^[13].

hoya, hoyo. (Spanish.) A very large closed depression. Used in Puerto Rico for doline, in Cuba for polje^[10].

hum. 1. Karst inselberg. Residual hill of limestone on a fairly level floor, such as the isolated hills of limestone in poljes. In some tropical areas, used loosely as synonym for mogote^[10]. 2. Yugoslavian term for an isolated residual hill on the bottom of a polje^[20]. Synonyms: (French.) *butte témoin*; (German.) *Karstinselberg*, *Hum*; (Greek.) *karstiki martyree lophi*; (Italian.) *testimoni carsici*; (Russian.) *karstovij ostanec*; (Spanish.) *hum*; (Turkish.) *karst adatepesi*; (Yugoslavian.) *hum*. See also karst inselberg; mogote.

humidity, absolute. The moisture content by weight per unit volume of air^[16].

humidity, relative. The ratio, expressed as a percentage, of the amount of water vapor actually present in air of a given temperature, as compared with the greatest possible amount of water vapor that could be present in air at that temperature. Calculation of relative

humidity can be done from tables, special slide rules or calculators, graphs, or complex equations^[23]. See also *hygrometer*; *psychrometer*.

humus-water grooves. This is a special type of meandering karren or wall karren in which the water originated in humus covering. Water originating from a humus cover has an excess of CO₂ and is therefore, very aggressive and can dissolve large amounts of limestone. Thus humus-water grooves can be very deep but after approximately 2–3 meters, the grooves flatten out and continue as normal meanders or wall karren^[3]. See also meander karren; wall karren.

huntite. A cave mineral —
CaMg₃(CO₃)₄^[11].

hydration. The act by which a substance takes up water by absorption and/or adsorption^[6].

hydraulic barrier. A general term referring to modifications of a ground-water flow system to restrict or impede movement of contaminants^[22].

hydraulic conductivity. 1. A proportionality constant relating hydraulic gradient to specific discharge which for an isotropic medium and homogeneous fluid, equals the volume of water at the existing kinematic viscosity that will move in unit time under a unit hydraulic gradient through a unit area measured at right angles to the direction of flow^[22]. 2. The volume of water that will move through a medium in a unit of time under a unit hydraulic gradient through a unit area measured perpendicular to the

direction of flow^[22]. 3. The ability of a rock unit to conduct water under specified conditions^[10]. It is typically expressed as gpd/ft², ft/day, or m/day.

hydraulic conductivity, effective. The rate of flow of water through a porous medium that contains more than one fluid, such as water and air in the unsaturated zone, and which should be specified in terms of both the fluid type and content and the existing pressure.

hydraulic diffusivity. See diffusivity, hydraulic.

hydraulic discharge. The discharge of ground water through springs or wells^[16].

hydraulic fracturing. The formation of artificial fractures in rock systems around a well by high pressure fluid injections^[16].

hydraulic gradient. 1. The change in static head per unit of distance in a given direction. If not specified, the direction generally is understood to be that of the maximum rate of decrease in head^[22]. 2. Slope of the water table or potentiometric surface^[22]. 3. A change in the static pressure of ground water expressed in terms of the height of water above a datum, per unit of distance in a given direction^[22].

hydraulic head. The height above a datum plane (such as sea level) of the column of water that can be supported by the hydraulic pressure at a given-point in a ground-water system. For a well, the hydraulic head is equal to the distance between the water level in the well and the datum plane^[22].

hydraulic jump. 1. A standing surge of water passing from below critical depth in open channel flow^[16]; often occurs in caves. 2. An abrupt depth variation in rapidly varying channel flow^[16].

hydraulic profile. A vertical section of the potentiometric surface^[16].

hydraulic radius. The ratio of the filled cross-sectional area to wetted perimeter^[16].

hydrochemical facies. Distinct zones that have cation and anion concentrations of diagnostic chemical character of water solutions in hydrologic systems which is describable within defined composition categories^[22].

hydrocompaction. The process of volume decrease and density increase that occurs when moisture-deficient deposits compact as they are wetted for the first time since burial^[21]. Synonym: shallow subsidence.

hydrogeologic. Those factors that deal with subsurface waters and related geologic aspects of surface waters.

hydrograph, characteristic. A hydrograph based on the unit step process.

hydrodynamic dispersion. 1. The spreading (at the macroscopic level) of the solute front during transport resulting from both mechanical dispersion and molecular diffusion^[22]. 2. The dynamic dispersion of fluid particles in flow through a porous medium due to velocity changes in the pore channels^[16].

hydrodynamic dispersion, coefficient of. See dispersion coefficient.

hydrogeochemistry. The geochemistry of water as related to the occurrence of subsurface water^[16].

hydrogeologic. Those factors that deal with subsurface waters and related geologic aspects of surface waters^[6].

hydrogeologic unit. 1. Any soil or rock unit or zone which by virtue of its hydraulic properties has a distinct influence on the storage or movement of ground water^[22]. 2. Means a soil or rock unit or zone which by virtue of its porosity or permeability, or lack thereof, has a distinct influence on the storage or movement of ground water^[22].

hydrogeology. The study of subsurface waters in their geological context^[16].

hydrograph. 1. A graph relating stage, flow, velocity, or other characteristics of water with respect to time^[22]. 2. A time record of stream discharge at a given cross section of the stream or of the stream surface elevation at a given point^[16].

hydrograph separation. The separation of a hydrograph into its different components to analyze flow contributions^[16].

hydrography. The geographical description of water bodies on the earth's surface^[16].

hydrologic barrier. See barrier, hydrologic.

hydrologic budget. The quantitative accounting of all water volumes and their changes over time for a given basin or province^[16].

hydrologic properties. Those properties of a rock that govern the entrance of water and the capacity to hold transmit, and deliver water, such as porosity, effective porosity, specific retention, permeability, and the directions of maximum and minimum permeabilities^[22].

hydrology. The study of atmospheric, surface, and subsurface waters and their connection with the water cycle^[16].

hydromagnesite. A cave mineral — $Mg_5(CO_3)_4(OH)_2 \cdot 4H_2O$ ^[11].

hydrometeorology. Meteorology dealing with water in the atmosphere^[16].

hydrometric station. A station at which there usually are a number of hydrometric measurements being performed^[16].

hydrometry. The science of water measurements^[16].

hydrophilic. Having a great affinity for water^[16].

hydrophobic. The repelling of water^[16].

hydrophyte. A plant requiring large amounts of moisture for growth^[16].

hydrosphere. That part of the earth that contains liquid or solid water^[16].

hydrostatic pressure. The pressure due to a column of water^[25].

hydrostratigraphic unit. See hydrogeologic unit.

hydroxylapatite. A cave mineral — $\text{Ca}_5(\text{PO}_4)_3(\text{OH})$ ^[11].

hydrozincite. A cave mineral — $\text{Zn}(\text{CO}_3)_2(\text{OH})_6$ ^[11].

hyetograph. A graph of rainfall intensity against time^[16].

hygrometer. 1. An instrument that reads the humidity in the air directly; some are based on a hair's ability to shrink or expand with humidity, or on certain electronic chips. Generally, a psychrometer is more accurate at higher humidities (above 95%)^[23]. 2. Apparatus for the direct measurement of the relative humidity in the atmosphere^[16]. See also *psychrometer*.

hygroscopic nucleus. Small solid particles around which water condensates (cloud formation)^[16].

hygroscopic water. Condensed water at a solid surface^[16].

hypogaeum. The subterranean environment^[23].

hypolimnion. A deep layer in stratified water^[16].

hygroscopic coefficient. The amount of absorbed water on the surface of soil particles in an atmosphere of 50% relative humidity at 25°C^[16].

hypogean. Pertaining to, or living in, regions deeper than the endogean zone. See also epigean.

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<http://wasg.iinet.net.au/terminol.html>

which contains a listing of terminology commonly used in Australia.