

abduction: the action of moving a skeletal element away from the midline of the body.

aborigine: an original inhabitant of an area.

absolute date: the exact date of an artifact or site based on the calendar. Absolute dates can be determined by radiocarbon dating (^{14}C or Carbon-14), Potassium-Argon (K-Ar), or Argon-Argon (Ar-Ar) dating; contrasts with relative dating.

acetabulum: the socket of the hip joint; an articular surface that encompasses the head of the femur.

Acheulean: a Lower Paleolithic tool culture first associated with *Homo ergaster* and *Homo erectus*; characterized by bifacially-flaked hand axes dating from around 1.5 million years ago to 150,000 years ago.

adaptation: the process of adjusting to a particular environment or niche; a morphological or behavioral feature of an organism that evolved through natural selection to play a role or fulfill a particular function.

adaptive radiation: the rapid divergence and spread of a group of organisms into available ecological niches, followed by a slower period of adaptations to their new environment, commonly resulting in a speciation event; similar to *punctuated equilibrium*, but on a larger scale.

adduction: the action of moving a skeletal element toward the midline of the body.

adolescence: considered to be between the ages of 12-24 years; the period of growth between puberty and complete fusion of the epiphysis of the long bones.

aeolian: sediments deposited by the wind.

agriculture: the intentional cultivation of land and the production of plants and animals.

allele: a unit of hereditary information; an alternate form of a gene that sits at the same position on a chromosome.

allometry: the study of the relationship between the growth of an organism's specific part(s) in relation to its entire body.

allopatric speciation: the evolution of a daughter species from a parent species as a result of some barrier to gene flow between the new population and the ancestral population; requires complete reproductive isolation.

amino acid: chains of molecules that make up proteins. In total, there are 20 amino acids.

anagenetic speciation: when change is found solely within a lineage, and as changes accumulate over time, successive populations differ more and more from the "original" population. Eventually the two separate populations differ enough to be recognized as separate species. In this case, speciation results from microevolutionary changes.

analogy: [adj. *analogous*] characteristics of organisms that are similar and share the same function(s), but are not the result of common ancestry.

anatomic position: a position generally accepted as the natural stance for an organism. In bipedal hominins, the anatomic position is an upright, erect posture with the arms at the sides and the palms of the hands facing forward; in quadrupedal primates, the anatomical position is an upright, bent posture with all four limbs outstretched and palms flat on the ground.

anatomy: the study of the structure of the body and the relationship of its parts.

angular unconformity: a break in the geologic record: a distinct line that separates a layer of sedimentary rock deposited over an earlier layer of tilted or folded sedimentary rock.

antemortem: the time period before death.

anterior: a relative term used for bipedal hominins (*i.e.*, those that travel on two legs) to describe features that are closer to the belly or front of the body; opposite of *posterior*. The term *ventral* is a synonym commonly used when referring to quadrupedal anatomy.

anthropoid: [Greek: "human-like shape"] in taxonomic classification, any member of the suborder Anthropoidea, including monkeys, apes, and humans, but excluding tarsiers and lemurs.

anthropology: the scientific study of humans, human culture, and the evolution of humans; subfields include archeology, cultural anthropology, linguistic anthropology, and physical anthropology.

anvil: a large, stationary surface (such as a rock) that a core is struck against in order to remove a flake.

apes: under the superfamily Hominoidea, this includes gibbons and siamangs in the family Hylobatidae and orangutans, gorillas, bonobos, and chimpanzees in the family Pongidae. Characteristics of apes include a larger body size, no tail, more complex behavior and cognitive abilities, and an increase period of infant development.

apomorphy: [syn. *derived trait*] a new or specialized trait. The presence of nails instead of claws is an apomorphy of primates that sets them apart from other mammals.

arboreal: refers to activity in trees; tree living

arboreal quadrupedalism: a mode of locomotion in which the animal moves along horizontal branches with a regular gait pattern involving all four limbs.

arboreal theory of primate evolution: the idea that primates evolved adaptations for living in trees.

archaeology: the investigation of culture through the study of remains left by humans.

archaic: ancient; old.

Archaic *Homo sapiens*: [sometimes referred to as *Homo heidelbergensis*] refers to ancient fossilized humans with features exhibited by both modern *H. sapiens* and *H. erectus*. Archaic *H. sapiens* fossils date between 600,000 and 30,000 years. There is disagreement over whether Archaic *H. sapiens* is a separate species (*i.e.*, *H. heidelbergensis*).

Archean: an era on the geologic time scale that approximately dates from 4.6 billion years ago to 2.5 billion years ago. The oldest fossils found on earth (*i.e.*, prokaryotes) date back to the Archean era.

***Ardipithecus kadabba*:** an extinct hominin species that existed in Africa approximately 5.8 to 5.2 million years ago; fossil remains have been found at Middle Awash and in Ethiopia, and show relatively thin dental enamel, possible canine-third premolar honing complex, and a humerus and manual phalanges typically of arboreality. Some scientists argue that *Ardipithecus* may represent the last common ancestor to chimpanzees and humans. The type specimen for *Ard. Kadabba* is ALA-VP 2/10, found at the Middle Awash site and approximately dates between 5.8 and 5.5 million years ago.

***Ardipithecus ramidus*:** an extinct African hominin species, possibly ancestral to humans, that existed approximately 4.4 million years ago in Ethiopia; very few post-cranial fossil remains have been found, but dental characteristics from a known *Ard. ramidus* specimen indicate relatively thin enamel, primitive first molars (*i.e.*, similar to chimpanzees) and a more derived third molar (*i.e.*, more elongated and large relative to the other molars). The forward placement of the foramen magnum hints at possible bipedal positioning. Some scientists argue that *Ardipithecus* may represent the last common ancestor to chimpanzees and humans. The type specimen for *Ard. ramidus* is ARV-VP 6/1, found at the Middle Awash site and dates to approximately 4.4 million years ago.

arrested evolution: when there is little change in morphology or genetics over a long period of time. In some cases, organisms exhibiting arrested evolution are referred to as "living fossils."

articulation: the point where two or more bones are joined together. Some articulations are movable joints like the elbow or knee, while some are unmovable like the sutures between cranial bones.

artifact: an object modified and/or used by hominins.

artificial selection: the process of selecting and breeding only those plants and animals with desired inherited features for the purpose of producing organisms with more of those desirable features. An example of artificial selection is the breeding of two parent horses known to run fast in the hopes of producing offspring that will win races.

assemblage: a set of artifacts or bones found in association with each other in an archaeological setting; an accumulation of bones or artifacts.

attrition: the wearing away of a surface through grinding or friction; the gradual reduction in number or strength resulting from stress.

auditory meatus: opening in the temporal bone that is commonly referred to as the ear canal.

***Australopithecus*:** the genus name for a form of extinct hominins ancestral to human that existed between approximately 4.2 million years ago to 1.8 million years ago; fossil australopithecines show evidence of bipedalism, but generally retain relatively small brains and stature. The genus *Australopithecus* includes, but is not limited to, the species *A. anamensis*, *A. afarensis*, *A. bahrelghazali*, *A. africanus*, and *A. garhi*.

***Australopithecus afarensis*:** an extinct African hominin species, possibly ancestral to humans, that existed approximately 4 million years ago to 2.8 million years ago; fossil remains have been found in East and Northeast Africa indicate that *A. afarensis* had an absolute brain size approximately 415 cc; with a forward projecting face similar to a chimpanzee, thick enamel on the teeth, and large incisors; the species exhibited sexual dimorphism in tooth and body size. *A. afarensis* appears to be a bipedal hominin but retained the primitive upper body morphology similar to arboreal primates (*i.e.*, relatively longer arms than legs and curved manual phalanges). The type specimen for *A. afarensis* is LH 4, found at Laetoli in Tanzania and dates to approximately 3.7 to 3.4 million years ago. The most famous *A. afarensis* fossil is AL288-1, "Lucy", found at Hadar in Ethiopia and dates to 3.2 million years ago.

***Australopithecus africanus*:** an extinct African hominin species, possibly ancestral to humans, that existed approximately 3 million years ago to 2 million years ago; fossil remains have been found in South Africa indicate *A. africanus* was very similar to *A. afarensis* in its post-crania, with an absolute adult brain size of approximately 440 cc, somewhat molarized premolars and an more inferior placement of the foramen magnum; exhibits high sexual dimorphism. The type specimen for *A. africanus* is the Taung Child found at the Taung site.

***Australopithecus anamensis*:** an extinct African hominin species, possibly ancestral to humans, that existed approximately 4.2 to 3.9 million years ago; fossil remains have been found in Kenya. Based on associated post-cranial remains, *A. anamensis* appears to have been bipedal, but with arms more like those seen in arboreal primates; the dentition is both primitive, with very large canines, and derived, with very thick enamel and large broad molars. The type specimen for *A. anamensis* is KP 29281, found at Kanapoi and dates to approximately 4 million years ago.

***Australopithecus bahrelghazali*:** an extinct African hominin species, possibly ancestral to humans, that existed approximately 3.4 million years ago to 3 million years ago; fossil remains have been found in Chad, and consists of a partial mandible and maxilla, including a three-rooted mandibular premolar, relatively thinner tooth enamel, and a more vertical lower face. In other ways, *A. bahrelghazali* is similar to *A. afarensis*. The type specimen for *A. bahrelghazali* is KT 12/H1, or "Abel", found at Bahr el Ghazal in Chad, and approximately dates between 3.4 and 3 million years ago.

***Australopithecus garhi*:** an extinct African hominin species that existed approximately 2.5 million years ago; fossil remains have been found in Ethiopia, and indicate *A. garhi* molars were large and more like *Paranthropus* than *Australopithecus*; post-cranial fragments offer a modern-like humerofermoral ratio and a *Pongo*-like brachial index; associated fauna found at the site show evidence of butcher marks suggesting *A. garhi* may have used stone tools to process food. The type specimen for *A. garhi* is BOU-VP-12/130, found at the Middle Awash site in Ethiopia, and dates to approximately 2.5 million years ago.

autosome: [adj. *autosomal*] all chromosomes except for the sex chromosomes.

awl: a sharp tool used to punch holes in leather or wood; typically made of stone, bone, or antler.

basalt: a common type of fine-grained igneous rock formed from solidified molten lava; typically composed of dark colored minerals including plagioclase, pyroxene and olivine.

base pair: the four bases in DNA: adenine (A), guanine (G), thymine (T), and cytosine (C). During the replication process, adenine bonds with thymine (A-T), and cytosine bonds with guanine (C-G), if there are no mutations.

bed: a single layer of sediment.

bedding: the arrangement of different sediments or rock layers.

bentonite: a clay that forms from the weathering of volcanic ash.

Beringia: [syn. *The Bering Land Bridge* or *Bering Strait*] a now submerged portion of the continental shelf about 1,000 miles wide located between Northeast Siberia and the western coast of Alaska. Many archaeologists believe humans used this route to cross into North America when sea levels were much lower.

bicondylar angle: the angle at which the shaft of the femur sits relative to the line that sits perpendicular to the midline of the body. See also *valgus knee*.

biface: A stone tool that has been worked on both sides (*i.e.*, faces).

bilateral: paired elements present on both the left and right side of the body, or a condition that effects both sides of the body.

billet: A tool for soft percussion, typically made of antler or wood.

bilophodonty: a cusp pattern where ridges (*i.e.*, lophes) are present between the pair of mesial and distal molar cusps.

binomial nomenclature: the scientific name of an organism consisting of two taxonomic terms (*i.e.*, the genus and species name). For example, the binomial nomenclature for modern humans is *Homo sapiens*.

biological diversity: [syn. *biodiversity*] the different environments and species on the earth; the genetic variability seen in life.

bipedal: a form of positional behavior (*i.e.*, posture and locomotion) that utilizes only the hind limbs; an animal that locomotes on two legs is referred to as a biped. See also *facultative bipedalism* and *habitual bipedalism*.

blade: a stone tool with a length that is twice its width; usually hafted into bone or wooden implements.

body fossil: a fossilized skeleton or other hard morphology of a multicellular organism.

brachiation: arboreal locomotion in which the body is suspended under the hands, legs or tail, and locomotion is propelled by the arms swinging alternately and grasping branches. Apes and humans can brachiate.

branching event: a point on the evolutionary lineage of an organism which diverges, or splits off, from the ancestral line into a new evolutionary lineage as a result of numerous unique adaptations.

breccia: a type of stone that consists of relatively larger angular stone fragments cemented among a finer sediment matrix.

Broca's area: area of the brain located on the left side of the frontal lobe responsible for the production of speech, including muscle control of the mouth, tongue and larynx.

brow ridge: [syn. *supraorbital torus*] the bony protrusion above the eye orbit seen in many primates. The brow ridge is very pronounced in *Paranthropus*, *H. heidelbergensis*, and *H. neanderthalensis*.

buccal: a relative term referring to the part of the mouth that is closer to the cheek; the opposite of *lingual*.

bulb of percussion: the point on a lithic (*i.e.*, stone tool) that was struck and can be visualized as swelling on the striking platform surrounded by ripples.

bunodont: premolars and molars that have low, rounded cusps.

burin: A flake with a chisel-like edge, possibly used for engraving or carving wood/bone.

calcaneus: heel bone.

calibration: the process of determining the date of an object.

Cambrian: a period on the geologic time scale approximately dating from 540 million years to 500 million years; marks the appearance of the first metazoan skeletons, reefs and vertebrates. The Cambrian was dominated by trilobites.

canine: a single cusped tooth located behind the later incisor and in front of the first premolar.

canine reduction: refers to canine teeth that are smaller in all dimensions relative another canine specimen.

Carbon-14: ^{14}C ; an unstable Carbon isotope that decays into a stable Nitrogen isotope; has a half-life of 5,730 years.

Carbon-14 dating: an absolute dating technique that measures the amount of ^{14}C present in a sample; can only be used on organic material dating between a few hundred years old to about 40,000 years old. Note: the older the object, the greater the probability of error in the dating process. See also *radiocarbon dating*.

Carboniferous: a period in the Paleozoic era on the geologic time scale approximately dated from 345 to 280 million years. It is called the "Age of Vegetation" because many swamps covered the earth's surface during this time.

carnivore: a dietary category that describes animals that specialize in eating only meat; animals included in the taxonomic order Carnivora.

catarrhine: in taxonomic classification, any member of the infraorder Catarrhini including Old World monkeys, apes and humans.

caudal: the relative term used for quadrupedal animals (*i.e.*, those that travel on four legs) to describe features that are closer to the tail of the trunk; the opposite of *cranial*; the term *inferior* is a synonym commonly used when referring to bipedal hominins.

Cenozoic: [Greek: "recent life"] an era on the geologic time scale that approximately dates from 65 million years to the present; contains the geologic periods Quaternary and Tertiary. It is also known as the "Age of Mammals," since this was the time when many mammals evolved.

cercopithecoid: in taxonomic classification, members of the family Cercopithecidae, including Old World monkeys.

character: an anatomical, physiological, or behavioral features of an organism.

character state: the absence, presence, or developmental state (*e.g.*, size and shape) of a character.

cheek tooth: a post-canine tooth used for crushing.

chert: a raw material used to make stone tools. Chert is similar to flint and found irregular formations throughout sedimentary deposits.

childhood: stage in human development after infancy and before juvenile; considered to be between the ages of 3 and 12 years old in most cultures.

chopper: usually a simple cobble-sized tool with a few flakes removed from its perimeter to form a cutting edge; typical of the Oldowan tool industry.

chromosome: a large molecule found in cells that contains DNA. Humans have 46 chromosomes (44 autosomal and 2 sexual), but different species have different chromosomal numbers.

clade: in cladistics, a species or group of species that represents the descendants from a single common ancestor; a holophyletic group.

cladistic analysis: a type of classification that looks at evolutionary histories based on the analysis of shared derived traits.

cladogenetic speciation: a splitting or diversification event, usually over a short period of geologic time. As populations begin to differ more and more from one another, they may eventually be recognized as different geographic variants of the same species. Given enough time, they will be recognized as separate species.

cladogram: a chart that demonstrates evolutionary relationships based on derived traits; the ultimate result of cladistic analysis.

classification: arrangement of organisms into groups based on comparable characteristics.

closed environment: an geographic area with a substantial canopy of foliage limiting the amount of light that is able to reach the ground.

Clovis point: a bifacial projectile point dating to about 11,000 years before present and known from the Americas; probably hafted to spears and were used for big game hunting.

condyle: an articular prominence of a bone.

congenital: from birth.

conspecific: organisms belonging to the same species.

context: place in space and time.

continental drift: the movement of continents due to plate tectonic processes.

convergence: [*syn. convergent evolution*] the adaptations of similar traits in two or more unrelated species either by chance or through similarity of function; the opposite of *divergent evolution*. Bat wings and butterfly wings are an example of convergent evolution.

core: lithic material resulting from the removal of tool material and debitage flakes from its surface.

coronal suture: the suture between the frontal and parietal bones in the cranium.

cortex: the rough outside of raw stone materials formed by chemical and mechanical weathering processes.

cortical bone: the thick exterior layer of smooth bone.

costal: an adjective that describes the ribs.

cranial: refers to the skull and mandible; a relative term used for quadrupedal organisms (those that travel on two legs) to describe features that are closer to the head or top of the body; opposite of *caudal*. The term *superior* is a synonym commonly used when referring to bipedal hominin anatomy.

cranium: the bones that surrounds the brain case; the skull excluding the mandible and hyoid bones.

crepuscular: describes organisms that are mostly active during dusk and dawn.

crest: a ridge on the chewing surface of a tooth that connects the cusps to one another.

Cretaceous: a period in the Mesozoic era on the geologic time scale that approximately dates from 136 million years to 65 Million years; marked by a mass extinction event at the end of the period effecting the dinosaurs and many marine organisms.

cross cutting relationships: any igneous intrusion or cutting event (*i.e.*, fault) is always younger than the strata through which it cuts; can be used as a relative dating technique.

cusp: a rounded or pointed projection made of enamel on the chewing surface of a tooth

cut mark: an incision on a bone or fossil made by stone tools as opposed to carnivores' teeth; can be seen using a microscope or with the naked eye.

Darwin, Charles: (1809-1882) a British naturalist who authored *On the Origin of Species* (1859); proposed the theory of natural selection which changed many biologists' views on evolution.

Darwinism: refers to the mechanisms of evolution as proposed by Charles Darwin in his book *On the Origin of Species* (1859), including the theory of natural selection.

dating techniques: a method of calculating the age of an event or organism; dates may be established through relative or absolute means.

death rate: the frequency of individuals in a population dying over a set period of time.

deciduous: lost during development; an anatomical reference to primary or "baby" teeth (deciduous dentition).

deletion: when one or more base pairs is removed from a sequence in DNA as a result of replication errors or mutations.

demography: a study of the increase or decrease in population size and what may have caused these changes (*i.e.*, survival rates, death rates, reproduction, etc.).

dens: the odontoid process located on the second cervical vertebrae (*i.e.*, the axis).

dental formula: a standardized notation for the total number of incisors, canines, premolars, and molars in the upper and lower jaw seen in an organism. An adult human dental formula is expressed as 2.1.2.3./2.1.2.3.

dentine: the chief tissue of a tooth; a tissue in the middle of the tooth that surrounds the pulp cavity and is covered by enamel on the crown and cementum on the root of the tooth.

dentition: teeth.

deoxyribonucleic acid: a nucleic acid based on the five-carbon sugar deoxyribose in a double helix formation; found within chromosomes that carries genetic information. See also *DNA*.

deposition: sediments accumulating on the surface of the earth.

derived trait: a recently acquired trait.

descent with modification: genetic material, including mutations, that is passed from parent to offspring; the most basic principle of evolution.

Devonian: a period in the Paleozoic era on the geologic time scale that approximately dates from 395 million years to 345 million years; marked by a mass extinction event at the end of the period that affected coral reefs and small marine organisms; the first fossils evidence of terrestrial vertebrates appears in the Devonian period.

diagenesis: the physical, chemical and biological changes affecting a fossil after deposition.

diagnostic: refers to an artifact from a distinct time period and/or tool industry; a bone that is identifiable as a particular species.

diaphysis: primary ossification center, or shaft, of long bones.

diastema: a space between teeth.

digging stick: a tool used by hominins to access below ground plant parts such as roots and tubers; can be constructed of wood, bone, horn, or antler.

diploidy: the state of cells containing two copies of each chromosome. Humans are diploids.

directional selection: when one extreme is selected against, changing the average composition of the population by removing the variants at that one extreme.

discoids: irregular, bifacially worked tools that have a working edge around their full (or greater majority) circumference.

disconformity: a break in the geologic record; a line that separates a layer of sedimentary rock deposited over a layer of previously eroded sedimentary rock.

disruptive selection: when the mean is selected against, driving the extremes of the population farther and farther from each other; may ultimately split the population into two separate populations.

distal: a relative term used to describe a part of a limb that is farther from the attachment point to the trunk of the body; the opposite of *proximal*.

diurnal: refers to an organism whose primary activities are during daylight hours.

divergence: [syn. *divergent evolution*] when genetic or character differences accumulate causing members of the same species to become increasingly different; the opposite of *convergent evolution*.

DNA: the abbreviation for deoxyribonucleic acid.

DNA sequence: the order of nucleotides in DNA.

domestication: the process in which humans supervise and control characteristics of plants and animals.

dominant allele: an allele that is expressed in the phenotype regardless of its recessive alternative.

dorsal: a relative term used for quadrupedal organisms (*i.e.*, those that travel on four legs) to describe features that are closer to the spine or back of the body; opposite of *ventral*. The term *posterior* is a synonym commonly used when referring to bipedal hominin anatomy.

dorsiflexion: flexing the foot upwards towards the leg.

early childhood: stage in human development commonly accepted to be between the ages of 3-5 years.

- earth's magnetic field:** the natural magnetic field that surrounds the earth's surface due to electrical currents.
- eburnation:** the polished appearance of a bone due to cartilaginous damage and the contact of bone to bone at a joint.
- ecological niche:** the place that an organism or a group of organisms occupies in an ecosystem and its interactions with the surrounding environment.
- ecology:** the study of the relationship between an organism and the surrounding environment.
- ecosystem:** a unit in ecology that consists of organisms and non-living objects that may affect the environment.
- edge ware analysis:** the methodologies associated with studying the microwear produced along the edges of stone tools when they were used for specific processing tasks so that inferences can be made with regard to how ancient tools were used.
- Ediacaran:** the last epoch of the Vendian period on the geologic time scale that approximately dates from 590 million years ago to 570 million years ago.
- enamel:** a very hard substance that covers the dentine on the crown of a tooth.
- encephalization:** increase in brain size without an increase in body size.
- endocast:** a cast of a brain through natural or artificial processes.
- endocranial capacity:** the size of the space in the cranium where the brain sits.
- environment:** a geographically defined area that includes its geological and ecological settings and the biological organisms that inhabit the area.
- Eocene:** an epoch in the Tertiary period on the geologic time scale that approximately dates from 55 million years ago to 35 million years ago.
- epiphysis:** the second center of ossification in long bones; separated from the shaft by an epiphyseal plate.
- epoch:** a unit of geological time longer than an age and shorter than a period.
- era:** a unit of geological time shorter than an eon and typically broken down into subdivisions of time called periods.
- erosion:** the process by which sediments are displaced by water, wind, ice, or gravity.
- eversion:** when the sole of the foot is turned laterally; the opposite of inversion.
- evolution:** descent through genetic modification; a change in gene allele frequencies from one generation to the next.
- exaptation:** an evolved character, usually not built by natural selection, whose current use is not the same as its original use. For example, feathers originally evolved as insulation but were later adapted to assist with flight mechanics.
- extant:** a species that is currently living; opposite of *extinct*.
- extension:** a movement to increase the angle between a joint; see also *flexion*.
- extinct:** a species that is no longer living; may be identifiable only through the fossil record or eye witness accounts. Some species have gone extinct during the current historical period.
- extinction:** the process of becoming extinct; the termination of a species.
- extraordinary fossils:** the preservation of the soft morphology (e.g., skin, feathers, body organs) of an organism in the fossil record; very rare.

- fact:** a statement about a phenomenon that is objectively verified, and thus, considered to be true.
- facultative bipedalism:** when an animal assumes a form of bipedalism on a temporary basis in order to perform a particular action.
- family:** in taxonomic classifications, all members of the same genus, but only certain members of an Order.
- fault:** a break in the earth's lithosphere (*i.e.*, crust).
- fauna:** animals.
- faunal correlation:** a method of relative dating that compares the faunal remains (*i.e.*, fossils) located in one strata with faunal remains in other strata and assigning similar ages to the strata that contains similar fossils.
- fetal:** stage in human development that lasts between 10 weeks after conception until birth.
- fitness:** the measurement of a genotype's reproductive success.
- fitness (Darwinian):** the ability to survive and reproduce in a particular environment.
- fitness (Inclusive):** a cumulative measurement of an individual; the relative number of fertile offspring produced per unit of time. The individual in a population with the most surviving fertile offspring has a relative fitness of 1; individuals with no offspring have a fitness of zero. Fitness scores of other individuals are the ratio of the number of their surviving fertile offspring to the maximum number from any individual.
- flake:** a fragment of stone generated during the reduction process of making a stone tool. Flakes may be primary (where one surface is entirely cortex), secondary (with traces of cortex), or tertiary (no cortex, came entirely from the inner core).
- flexion:** the movement that results in the angle between skeletal elements getting smaller. Different muscles act to flex or extend different skeletal elements. See also *extension*.
- flint:** a type of quartz found in irregular formations through sedimentary deposits that is commonly used in the manufacture of stone tools..
- flora:** plants.
- fluvial:** related to rivers or river systems; sediments deposited by water.
- folivore:** a dietary category that describes animals that specialize in eating primarily foliage, such as leaves.
- foramen:** a hole or opening in a tissue, such as bone; usually accommodates the passage of a blood vessel or a nerve.
- foramen magnum:** the large hole in the occipital bone that allows for the passage of the spinal cord to the brain. The placement of the foramen magnum in the skull is an indication of bipedal or quadrupedal behavior.
- fossil:** the preservation of floral or faunal remains or an imprint of those remains. There are several types of fossils including: body fossils – when the skeletal elements are preserved; trace fossils – preserved evidence of an organism's behavior; and extraordinary fossils – preservation of the soft tissue of an organism.
- fossilization:** the process of organic material transforming into a fossil; includes the burial and preservation processes. These processes include mummification, desiccation, permineralization, impressions, carbonization, molds and casts and Siderite concretions.
- founder effect:** when a portion of a population is geographically isolated, and, due to the small sample size, subsequent generations no longer represent the genetic diversity seen in the original population.
- fracture:** a break or crack in a bone or cartilage.

frugivore: a dietary category that describes animals that specialize in eating primarily fruit.

functional morphology: the study of the relationship between an organism's lifestyle and its anatomy.

gene: a specific sequence of nucleotides in DNA or RNA that is the unit of inheritance specifying the structure of a protein.

gene flow: the transfer of genes from one population to another; contributes to genetic diversity.

gene frequency: percentage of a certain form of gene within a population in relation to the total forms that could possibly be expressed in genes.

generalized trait: a trait not adapted to a specific environment or niche.

genetic bottleneck: a reduction in the size of a population followed by a large increase in population, resulting in the loss of alleles, lessening the degree of genetic variability.

genetic distance: the measure of how related two or more different populations are to one another based on shared genetic material; can be determined comparing the similarity of allele frequency between populations.

genetic drift: an accidental shift in gene allele frequencies.

genome: all the hereditary information (*i.e.*, genetic make-up) of an organism that is encoded in DNA.

genotype: genetic material; the combination of alleles that make up an organism's DNA; entirely hereditary.

genus: in taxonomic classification, describes a group of organisms that all belong to the same family, but not to the same species. Populations within the same genus are related, but incapable of successful interbreeding.

geofact: a rock accidentally shaped by natural processes to resemble an artifact intentionally made by humans.

geologic formation: a topographical feature that occurs naturally, such as a hill.

geology: the science that studies the physical history of the earth, including compositional material and changes over time, and understanding past geologic events.

gestation: the period between fertilization of the ovum and birth.

glacial period: a unit of geological time characterized by advances in glaciers or ice sheets.

Gondwana: [syn. *Gondwanaland*] a supercontinent present in the southern hemisphere during the Paleozoic era that collided with Laurasia to form Pangea; consisted of present day South America, Africa, Antarctica, India, Southeast Asia and Australia.

gracile: characterized as being small bodied or has lightly-constructed anatomy; the opposite of *robust*.

grade: [syn. *clade*] a group organisms with similar characteristics that may or may not depict evolutionary relationships.

gradistic classification: a way to classify organisms based on grade as opposed to ancestry.

graver: A modified flake with a small, distinct point that may have been used for engraving or carving wood/bone.

greater apes: refers to the gorilla, chimpanzee, and orangutan.

habitat: the natural place or environment in which a species or organism lives.

habitual bipedalism: when an animal assumes a form of bipedalism on a permanent basis due to habit or anatomy.

Hadar: an African paleontological and archaeological site located in the Afar triangle region of Ethiopia. Hadar became famous after "Lucy", the most complete *Australopithecus afarensis* fossil ever recovered, was found there in 1974.

hafting: attaching a tool, such as a spear point or arrowhead, to a shaft.

half-life: the average amount of time, usually at a constant rate, that it takes for a radioactive parent isotope to decay into a stable daughter isotope..

hallux: the first toe; also known as the big toe.

hammerstone: a hard cobble used to strike a core in order to remove flakes; identified by the presence of battered wear on the ends, formed by repeated striking of a core.

hand axe: a bifacial stone core tool probably used for cutting and chopping; associated with the Acheulean tradition.

haplorhine: in taxonomic classification, members of the suborder Haplorhini, including tarsiers, monkeys, apes and humans.

Harris lines: transverse lines that form at the ends of long bones in the body that develop as a result of intense nutritional stress during growth; similar to *hypoplasia* on the teeth.

herbivore: a dietary category that describes animals that specialize in eating primarily plant material, such as grass.

heredity: the process of transmitting genetic material from parent to offspring.

heterozygote: when an organism has two or more different alleles at a particular locus in a chromosome.

Holocene: an epoch in the Cenozoic period on the geologic time scale that approximately dates from 10,000 years ago to the present; marked by the domination of *Homo sapiens*.

holophyletic group: in cladistics, a clade (*i.e.*, group) that consists of a single common ancestor and all its descendants. Holophyletic of often preferred to its synonym monophyletic.

home range: an area of permanent occupation by an individual or group of individuals. Males and females of the same species may have overlapping home ranges, but members of the same sex of a species will never have overlapping home ranges.

hominid: a term most commonly used to describe humans and our bipedal fossil relatives to the exclusion of the other large apes. In a formal sense, *hominid* reflects a classification that groups humans and their bipedal fossil relatives in the family Hominoidea to the exclusion of the apes who are placed in the families Hylobatidae (gibbon, siamangs) and Pongidae (orangutan, chimpanzee, bonobo, gorilla).

hominin: a term most commonly used to describe the group that includes humans and our bipedal fossil relatives. In a formal sense, hominin reflects a new classification based on the close genetic relationship among humans and chimpanzees that places them in the subfamily Hominine and separates the humans and their close fossil relatives into a separate tribe. Under this scheme, humans and their close relatives are *hominins*.

hominoid: a term most commonly used to informally describe the apes (gibbon, siamang, orangutan, chimpanzee, bonobo, gorilla). In a formal sense, hominoid reflects a classification that places the large apes in the family Pongidae, the small apes in the family Hylobatidae, humans and their bipedal fossil relatives in the family Hominidae, and groups all of these in the superfamily Hominoidea. Under this scheme, all of these species are hominoids, but the term is usually restricted to the apes only.

Homo: a genus dating back 2.5 million years, that includes modern humans (*i.e.*, *Homo sapiens*) and other extinct species, including *H. habilis*, *H. ergaster*, *H. erectus*, *H. antecessor*, *H. heidelbergensis* (*i.e.*, Archaic *H. sapiens*), and *H. neanderthalensis*; characterized as the first hominin to radiate outside of the African continent, an increase in brain and body size, and is currently the first hominin associated with stone tool manufacture and use.

Homo antecessor: an extinct hominin species that existed approximately 800,000 years ago; fossil remains have been found in Spain. *H. antecessor* had an increased brain size (*e.g.*, approximately 1,000 cc), a flattened face, a deep fossa between the nasal aperture and the cheek bone, and large canines and incisors. Some scientists suggest *H. antecessor* may be the last common ancestor of modern humans and Neanderthals, via *H. heidelbergensis*, because they appear to have a combination of primitive traits found in earlier *Homo* forms and derived features not seen in Neanderthals nor *H. sapiens*. The type specimen for *H. antecessor* is ATD 6-5 found at Atapuerca and dates to approximately 780,000 years ago.

Homo erectus: an extinct hominin species that existed approximately 1.8 million years ago to 200,000 years ago; possibly the first hominin to migrate out of Africa; fossil remains have been found in Africa, Georgia, China, and Indonesia. *Homo erectus* has an increased body and brain size (850-1250 cc) and distinct sexual dimorphism. *H. erectus* also had a pronounced brow ridge, a slightly prognathic face, an elongated cranium and small cheek teeth. *H. erectus* is associated with manufacturing Acheulian stone tools. The type specimen for *H. erectus* is Trinil 2 found in Java and dates from 1 million to 700,000 years old.

Homo ergaster: an extinct hominin species that existed approximately 2 million years ago to 1.5 million years ago; dispersal of *Homo ergaster* is limited to the continent of Africa; fossil remains have been found in east and south Africa. *H. ergaster* had an absolute brain size of 500 to 600 cc, an increased body size, rounded brain case, a small prognathic face, pronounced brow ridge, and small teeth. *H. ergaster* shows definite sexual dimorphism. The type specimen for *H. ergaster* is KNM-ER 992, found at Koobi Fora and dates to approximately 1.5 million years ago. The most famous *H. ergaster* fossil is KNM-WT 15000 (or "Turkana Boy") found at Nariokotome, Kenya, and dates to 1.6 million years ago.

Homo habilis: an extinct hominin species that existed approximately 2.5 million years ago to 1.6 million years ago; fossil remains have been found in Africa. *Homo habilis* had a relatively small brain, reduced canines, and small molars; nicknamed "handy man" because the first good evidence of stone tool manufacture and use by humans is associated with *H. habilis* remains; marked by the first definitive evidence for an expansion in absolute brain size that is clearly beyond the ape range. Some argue the size difference between *H. habilis* and *H. rudolfensis* may actually be a result of sexual dimorphism, and therefore *H. rudolfensis* may be of the same species as *H. habilis*. The type specimen for *H. habilis* is OH 7, found at Olduvai Gorge and dates to approximately 1.75 million years ago.

Homo heidelbergensis: [sometimes referred to as Archaic *Homo sapiens*] an extinct hominin species that existed approximately 600,000 years ago to 200,000 years ago; fossils have been found in Africa, Asia, and Europe. *H. heidelbergensis* retained many primitive traits such as a large face and separated brow ridge, but also shows an increase in brain size (1100-1300 cc), and a frontal bone and cranial base more similar to that of anatomically modern humans. *H. heidelbergensis* is associated with the first evidence of spear use. There is disagreement over whether *H. heidelbergensis* is a separate species (*i.e.*, Archaic *H. sapiens*). The type specimen for *H. heidelbergensis* is Mauer 1, found near Heidelberg, Germany and dates to approximately 500,000 years ago.

***Homo neanderthalensis*:** an extinct hominin species that existed in Europe and western Asia from 150,000 to 35,000 years ago. *Homo neanderthalensis* stature and brain size were comparable with modern humans, but certain features of their anatomy, such as large noses and a robust skeleton, may have been adaptations to Ice Age climates. Neanderthal burials show evidence of cultural treatment of the dead. *H. neanderthalensis* was replaced by successive radiations of *H. sapiens* into Europe, but there is no genetic evidence that the two species successfully interbred.

***Homo rudolfensis*:** an extinct African hominin species that existed approximately 2.4 million years ago to 1.6 million years ago; *H. rudolfensis* is very similar to *H. habilis* but with a much larger brain (751 cc), more flattened face and presumably larger body size. Some argue the size difference between *H. rudolfensis* and *H. habilis* may actually be a result of sexual dimorphism, and therefore *H. rudolfensis* may be of the same species as *H. habilis*. The type specimen, for *H. rudolfensis*, is KNM-ER 1470 found at Koobi Fora and dates to 1.8 million years ago.

***Homo sapiens*:** anatomically modern humans; an extant hominin species that evolved approximately 200,000 years ago to continues to exist in the present; *Homo sapiens* fossils have been recovered all over the globe, though the earliest fossils have been found in East and South Africa, and Israel. Diagnostic traits for *H. sapiens* include a relatively large brain size (about 1350 cc), a globular cranium, a continuous but reduced brow ridge, little to no prognathism of the face, and the presence of a chin. Post-cranially, *H. sapiens* is fully bipedal, have long limbs and a relatively short trunk, and appear to have decreased in body size around 35,000 years ago. Evidence all suggests *H. sapiens* replaced *H. erectus* regionally over several hundred thousand years. *H. sapiens* is associated with Middle and Upper Paleolithic tools; argued to be the first logistical hunters.

homology: [adj. *homologous*] characters shared as a result of common ancestry.

homoplasy: characters that are similar, but not the result of common ancestry; may be a result of convergent evolution and/or parallel evolution.

homozygote: when an organism has two or more of the same alleles at a particular locus in a chromosome.

horizon: a layer of strata that is unique from the ones above and below it.

humerofermoral ratio: a measure of the arms in proportion to the legs; calculated by dividing the length of the humerus by the length of the femur, multiplied by 100.

hunter-gatherer: a group of people whose subsistence depends on foraging or hunting and gathering foodstuffs. The size of a hunter-gatherer group can range from about 20-50 people.

hypocone: the distal cusp located on the lingual side of the upper molar.

hypoconid: the distal cusp located on the buccal side of the lower molar.

hypothesis: an assumption or guess, based upon observation, that may be supported or disproved through the scientific method.

ice age: refers to a period of time when the climate of the earth was much cooler and drier, causing wide-spread glaciation; because the sea level tends to drop during period of high glaciation, ice ages are considered to be times of active animal migrations into otherwise isolated parts of the world.

iliac ala: [plural: *iliac alea*] the "wing" of the ilium; a large fan-shaped structure making up the lateral portion of the ilium.

ilium: [plural: *ilia*] the bone that fuses into the os coxa, forming the hip; the anterior component to the acetabulum.

industry: tools with the same characteristics (*i.e.*, material or design) and are limited to a geographic region.

inferior: a relative term used for bipedal hominins (*i.e.*, those that travel on two legs) to describe features on the trunk that are closer to the feet; the opposite of *superior*. The term *caudal* is a synonym commonly used when referring to quadrupedal animals.

inherit: to acquire genetic material from a parent

innominate: [syn. *os coxae* or *pelvis*] the bone formed by the ilium, ischium, and pubis.

insectivore: a dietary category that describes animals that specialize in eating primarily insects.

insertion: [muscle insertion] a relative term describing the attachment of a muscle or ligament to a location on a bone that is farthest away from the center of the body, and the point on which the force of the muscle works.

instantaneous speciation: [syn. *polyploidy*] when the multiplication of chromosome (due to mistakes during meiosis or mitosis) produces instant reproductive isolation; only seen in plants.

interglacial: refers to an epoch or time frame between to ice ages, when glaciers have melted and the earth's temperature is relatively warmer.

intermembral index: a measure of the entire length of the arms in proportion to the entire length of the legs; calculated by dividing the length of the humerus and radius, by the length of the femur and tibia, multiplied by 100.

interspecific: between different species.

interspecific allometry: looking at differences between size and shape of different species. For example, the size and shape difference between a human and a chimpanzee.

intraspecific: within the same species.

inversion: turning the sole of the foot towards the medial portion of the body; opposite of *eversion*.

invertebrate: an animal with no vertebral column (*i.e.*, backbone or spine).

ischium: a bone that lies inferior to the ala and extends ventrally to join the pubis.

isotope: atoms of the same element that have the same number of protons, but differ in the amount of neutrons, therefore differing in atomic weight.

jaw: the maxilla and mandible.

Jurassic: a period in the Mesozoic era on the geologic time scale that approximately dates from 190 million years ago to 136 million years ago; marked as the period when dinosaurs flourished, large reptiles became the dominate animals, and the first appearance of birds.

Ka: acronym for "thousand years ago."

K-Ar dating: shorthand for potassium-argon dating.

Kay's threshold: the upper most weight limit for insectivorous primates and the lowest weight limit of folivorous primates; approximately 500 grams.

Kenyanthropus platyops: "Flat Face Man"; an extinct African hominin, a possible Pliocene ancestor to humans, that approximately dates from 3.5 to 3.3 million years ago, making it contemporaneous with *Australopithecus*; fossil remains have been found in Kenya, and include a relatively complete, but crushed, cranium and a few preserved teeth; *Kenyanthropus platyops* has a relatively small brain, small molars, and a relatively flattened face. The type specimen for *K. platyops* is KNM-WT-40000 found at Lomekwi.

knap: the process of striking a tool, such as flint or stone.

knapper: a person who knaps.

knuckle-walking: a type of quadrupedal movement used by apes where the upper body is supported by bent knuckles.

lactation: the process of producing milk through the mammary glands; a feature seen only in mammals.

Lamarck, Jean-Baptiste de: (1744-1829) one of the first scientists to study the relationships between organisms and propose the theory of evolution; most noted for his work on the "Great Chain of Being," a lineage classification system that suggested organisms might be ranked according to their morphological complexity with humans being the highest rank. Lamarck proposed the idea that morphology changed as a result of the organism's attempt to fit into its environment (*i.e.*, that a giraffe's long neck is the result of the animal stretching to reach higher branches). These newly acquired morphological features would be passed along to subsequent generations.

Lamarckism: the inheritance of acquired characters.

lambdoid: cranial suture that articulates between the parietals and occipital bones in the cranium.

land bridge: an area of land that connects two continents or larger areas of land; can be partially or temporarily submerged.

late childhood: considered to be between the ages of 6 and 12 years of age.

lateral: a relative term used to describe features that are farther from the midline or center of the body; the opposite of *medial*.

Laurasia: a supercontinent present in the northern hemisphere during the Paleozoic era that collided with Gondwana to form Pangea; consisted of present day North America and Europe.

lesser apes: the gibbon and siamang.

Levallois: a Middle Paleolithic stone tool manufacture technique in which a core is carefully prepared by removing flakes from around its periphery, with the final removal of a large flake from the core. This large flake can be used as a tool with sometimes only minimal retouch.

life expectancy: the average age an organism is expected to live.

life history: what an organism goes through and its developments from conception until death.

lineage: the descendants or ancestors of an individual or family.

lingual: a relative term referring to the part of the mouth that is closer to the tongue; the opposite of *buccal*.

Linnaeus, Carolus: (1707-1778) a Swedish biologist who saw all life forms as unchanging; authored *Systema Naturae*, and in its tenth edition (1758) proposed a method for organizing taxa that became the basis for all later taxonomic classification; also proposed the use of binomial nomenclature for naming taxa; some of his more significant contributions include the naming of humans as *Homo sapiens* and classifying the genus *Homo* with other primates. Unlike the "Great Chain of Being," which was a linear classification, the *Systema Naturae* organized animals in a two dimensional nested hierarchy according to morphological similarities, with humans no longer the highest order.

lithic: [Greek: "stone"] a stone tool or any byproducts of stone tool production (*i.e.*, debitage).

living floor: a surface found during excavations that is characterized by a relatively higher number of artifacts that could be associated with human occupation.

locality: place; location.

locomotion: movement to or from a place by an organism. Forms of locomotion include bipedalism, knuckle walking, brachiation, swimming, flying, etc.

Lower Paleolithic: [syn. *Lower Stone Age*] the time period of tool manufacture approximately dated between 2.5 million years and 250,000 years; tools associated with this time period include those of the Oldowan and Acheulean technologies.

Lucy: the nickname for specimen number AL 288-1; a female *Australopithecus afarensis* discovered in 1974 at the Hadar formation in Ethiopia that approximately dates to 3.2 million years. Characterized by evidence for bipedalism, Lucy is the most famous and complete australopithecine fossil ever recovered. Lucy received her nickname from the Beatles' song "Lucy in the Sky with Diamonds."

lumbar: the section of the back between the thorax and the pelvis.

lumbar curvature: the anteriorly convex curvature of the spine in the region of the lumbar vertebrae; helps to distribute the weight of the upper body more efficiently and brings the center of gravity closer to the midline and above the feet.

lumbar vertebrae: refers to the vertebrae that are located between the thoracic vertebrae and the sacrum.

Lyell, Charles: (1797-1875) a Scottish geologist who authored *Principles of Geology* (1830) in which he proposed the "Principle of Uniformitarianism" that states that natural laws are constant, that the geological processes seen today acted the same in the past, that geologic change is slow and happens at a uniform rate, and that the earth is fundamentally the same today as it was in the past. Lyell's ideas were influential for many other scientists, including Charles Darwin.

Ma: acronym for "million years ago."

macroevolution: change over long periods of evolutionary time.

magnetic field: a force surrounding a polarized object (*i.e.*, a magnet) whose axis of rotation is aligned with the earth's magnetic field.

magnetic reversals: irregular reversals of the earth's magnetic field; observed in the geologic record.

mandible: the lower jaw.

mandibular symphysis: the joint located at the center of the jaw that connects the two halves of the mandible that may or may not be fused.

mastication: chewing food.

maturation: the attainment of the final stages of tissue or organ differentiation; marked in primates by attainment of puberty, full dental eruption, and epiphyseal union of the skeletal elements.

medial: a relative term used to describe features that are closer to the midline or center of the body; the opposite of *lateral*.

megadont: very large teeth.

melanin: pigmentation in the skin that is a component of color in plants and animals.

member: a stratigraphic unit within a larger geologic formation.

mental: associated with the chin.

Mesolithic: see *Middle Paleolithic*.

Mesozoic: [Greek: "middle life"] a geological era that approximately dates from 245 million years ago to 65 million years ago; contains the geologic periods Cretaceous, Jurassic and Triassic.

metacone: the distal cusp located on the buccal side of the upper molar.

metaconid: the distal cusp located on the lingual side of the lower molar.

metaphysis: cartilage located between the diaphysis and the epiphysis that expands and eventually ossifies into bone; location of the growth plate.

metopic suture: a place of articulation in the frontal bone of the cranium that divides the bone in half. Fusion of the frontal bones begins about the second year of age in humans.

microevolution: changes over short periods of evolutionary time within a species or lineage.

microfossil: a fossilized skeleton of a tiny or unicellular organism.

microlith: a technology common in the late Pleistocene and early Holocene consisting of small (>3 cm), often geometric, pieces of knapped stone; often produced from small blades. Several microliths may be used to form a composite tool, such as barbs for an arrow or spear.

microwear: very small wear from teeth, tools, or organic material on a tool that is only large enough to be seen with a microscope.

midden: an accumulation of trash or excess deposits made by human activity; could be animal and/or food remains, and/or discarded artifacts.

Middle Paleolithic: [syn. *Middle Stone Age* or *Middle Paleolithic*] the time period of tool manufacture approximately dated between 250,000 and 40,000 years; tool associated with this time period include those of the Mousterian tool technology used by *Homo neanderthalensis* that deal with hunting, gathering and agricultural activities.

Middle Stone Age: see *Middle Paleolithic*.

migration: the movement of an organism or group of organisms from one location to another with the intention of relocating to that new area for an extended period of time.

minimum number of individuals: the minimum number of individuals (MNI) that would have had to have died in order to make up the assemblage. MNI is calculated by dividing the number of times each element occurs in an assemblage by the number of times it occurs in the skeleton of a single living individual. The MNI is the highest of the resulting numbers.

Miocene: an epoch in the Cenozoic era on the geologic time that approximately dates from 23 million years ago to 5.3 million years ago; marked by the evolution of apes.

Mississippian: a period in the Paleozoic era on the geologic time scale that approximately dates from 360 million years ago to 325 million years ago; marked by an abundance of planktonic protozoa, brachiopods and corals. The Mississippian is commonly referred to as the Carboniferous period outside of the United States.

mitochondrial DNA: deoxyribonucleic acid found within mitochondria.

MNI: see *minimum number of individuals*.

molecular clock: a hypothetical estimate of time used to date the existence of a common ancestor for two or more organisms; based on molecular differences that accumulate at a constant rate, allowing for statistical estimates.

monkey: a primate that possess a tail, exhibits quadrupedal locomotion, and is arboreal at least part of the time; inhabit the Old and New World; members of the Callitrichidae, Cebidae, and Cercopithecidae families. In taxonomic classifications, monkeys are graded lower than hominins, but higher than prosimians.

monogamy: a mating relationship involving only one male and one female.

monophyletic group: in cladistics, a clade (*i.e.*, group) that consists of a single common ancestor and all its descendants. *Holophyletic* is often preferred to its synonym *monophyletic*.

morphology: the form and structure of a physical feature.

Mousterian: a tool industry that approximately dates from 250,000 years ago to 40,000 years ago; associated with *Homo neanderthalensis* and possibly early modern *H. sapiens*; characterized by blades and burins prepared using the Levallois prepared-core technique. The tool kit also contained side scrapers and spear points.

mRNA: the abbreviation for messenger RNA.

mtDNA: see *mitochondrial DNA*.

Multiregional Hypothesis: a hypothesis that states anatomically modern humans evolved as a single species from archaic forms that were already living in Africa, Asia and Europe. The *Multiregional Hypothesis* suggests a significant amount of gene flow between modern *Homo sapiens* and the ancestral hominin form.

muscle: fibrous tissue in the body that contracts, which pulls on an attached structure creating movement.

mutation: a change in the genetic code as a result of an error during DNA reproduction.

natural selection: a mechanism of evolution involving differential reproduction. There are four components to natural selection: 1. Individuals vary within a population. 2. Individuals with traits beneficial to survival within their environment are more likely to reproduce than individuals without the trait. This means those individuals with the beneficial trait will contribute proportionally more genes to future generations. 3. The beneficial trait is inherited by the offspring. 4. Offspring that inherit the beneficial trait will also have a reproductive advantage (assuming a stable environment). As the number of individuals with the beneficial trait increases, then there is a larger the percentage of offspring that possess the trait. Natural selection thus does not necessarily reflect size, strength, or health, only the relatively ability to produce fertile offspring.

Neanderthal: see *Homo neanderthalensis*.

Neogene: a period in the Cenozoic era on the geologic time scale that approximately dates from 23 million years ago to 1 million years ago; consists of the Miocene and Pliocene epochs; marked by the collision of the North and South American tectonic plates, allowing for the migration of animals between the two continents.

Neolithic: see *Upper Paleolithic*.

New World monkey: primates that are in the suborder Platyrrhini whose natural habitats are located in Central and South America.

niche: the environment that an organism lives in.

nocturnal: refers to an organism primarily active during the night.

node: the point on a cladogram or phyletic chart that shows a line leading to two or more different species "branches" or separates from the main line; defined by *synapomorphies*.

nomad: an organism that continuously moves in search of resources for survival, such as food.

nonconformity: a break in the geologic record; a line that separates a layer of sedimentary rock deposited over a layer of igneous or metamorphic rock; typically indicates a long-continued erosion event between sedimentary deposition events.

- non-Darwinian evolution:** the idea that some genetic changes occur which are not subject to natural selection, but rather are a reflection of random processes (*e.g.*, the founder's effect), and that some evolutionary-genetic change is hidden from the editorial powers of natural selection (*e.g.*, silent and neutral mutations).
- nutrient foramen:** a small hole or opening in a bone through which blood vessels or nerves pass.
- occipital:** refers to the posterior (*i.e.*, back) of the head; the bone located at the back and base of the cranium.
- occlusal:** a relative term referring to the part of the mouth that is closer to the crown of the tooth; the opposite of *distal*.
- occlusion:** relationship between the upper and lower portions of the teeth.
- Old World monkey:** primates that are in the superfamily Cercopithecoidea whose natural habitats are in all regions of the world, except Central and South America.
- Oldowan:** a tool industry that approximately dates from 2.5 million years ago to 250,000 years ago; characterized by simple choppers and flakes that represent the oldest types of stone tools used mainly for food procurement and processing. The choppers are often very crude and have only a few flakes removed. The flakes were once thought to have been byproducts of the manufacture of the choppers, but are now believed to have also been used for cutting.
- Olduvai:** an African paleontological and archaeological site located in northern Tanzania in the Great Rift Valley. This site is well known for the work done by Louis Leakey starting in the 1950s and continued by his family. Fossil hominins such as *Australopithecus bosei* and *Homo habilis* have been found at Olduvai.
- olecranon-ulnar index:** the ratio of the length of the olecranon process of the ulna to the length of the ulna from the center of the trochlear notch to the distal head, multiplied by 100.
- olfaction:** smelling.
- Oligocene:** an epoch in the Cenozoic era on the geologic time scale that approximately dates from 34 million years ago to 24 million years ago; marked by the expansion of terrestrial mammals and the diversification of primates. The Oligocene is the third epoch of the Tertiary period.
- omnivore:** a dietary category that describes animals with no specialized diet and will eat any edible and/or nutritional foodstuffs (*i.e.*, plants and animals).
- open environment:** an geographic area with little to no canopy of foliage allowing a substantial amount of light to reach the ground.
- opposable thumb:** a thumb that is able to rotate along its long axis and can grip objects.
- orbit:** a cavity in the face that protects the eyes and its associated muscles and nerves.
- orbital convergence:** in primate evolution, the realignment of the orbits from the lateral sides of the face to orbits on the anterior portion of the face.
- order:** in taxonomic classification, all members of the same family, but only certain members of the same class.
- Ordovician:** a period in the Paleozoic era on the geologic time scale that approximately dates from 500 million years ago to 430 million years ago; marked by prevalence of trilobites and many shallow inland seas.
- organism:** a functional unit of animal or plant life. An organism can consist of one living cell, such as algae, or many living cells, such as a single human being.
- origin:** [muscle origin] the point from which a muscle arises and is not involved in the movement or action of the muscle.

original horizontality: the belief that smaller sediments are usually deposited in a horizontal layer. Therefore, if a stratum is tilted geologists are able to calculate the declination (i.e., degree of tilt or disturbance) from the horizontal.

Orrorin tugenensis: an extinct fossil hominin species that existed in Africa approximately 6 million years ago; fossil remains have been found in Kenya and include portions of a femur that exhibits evidence of bipedalism (i.e., a bicondylar angle).

os: bone.

os coxae: [syn. *pelvis*, *hip bone*, or *innominate*] [sing. *os coxa*] formed of two halves, each consisting of three fused bones: ilium, ischium, and pubis.

osteoblast: a cell that produces or deposits bone tissue by depositing protein.

osteoclast: a cell that erodes bone tissue.

Out of Africa Hypothesis: a hypothesis that states that an ancestral form to modern *Homo sapiens* evolved in Africa about 1 million years ago and migrated to the continents of Asia and Europe between 50,000 and 60,000 years ago. As human populations began to radiate into other parts of the globe, they underwent separate adaptive pressures resulting in at least three distinct near-modern human forms that were later replaced by modern *H. sapiens radiating from Africa*. The Out of Africa model suggests little to no gene flow between modern *H. sapiens* and the archaic forms *H. sapiens* replaced.

outgroup comparison: the assessment of one group's features to another in order to establish evolutionary relationships.

oxygen-isotope ratio: ratio of stable ¹⁶Oxygen and ¹⁸Oxygen isotopes found in fossils; can be used to determine the temperature of past environments in which the fossil was found.

palate: the roof of the mouth which is protected by a soft tissue.

paleoanthropology: the study of the fossil record of human evolution.

Paleocene: an epoch in the Cenozoic era on the geologic time scale that approximately dates from 65 million years ago to 24 million years ago; marked by the first appearance of horses, whales and many rodents in the fossil record. The Paleocene is the first epoch of the Tertiary period.

paleoecology: the study of past environments.

Paleogene: a sub-period in the Tertiary period on the geologic time scale that approximately dates from 65 million years ago to 24 million years ago; consists of the Paleocene, Eocene and Oligocene epochs.

Paleolithic: [Greek: "Old Stone Age"] the period of time that dates from the beginnings of stone tool manufacture and use (i.e., approximately 2.5 million years ago), and divided into three subgroups: *Lower Paleolithic*, *Middle Paleolithic*, and *Upper Paleolithic*.

paleomagnetism: the study of the earth's magnetic fields and its changes over time.

Paleozoic: [Greek: "early life"] a geological era that approximately dates from 540 million years ago to 245 million years ago; contains the geologic periods Permian, Carboniferous (i.e., Pennsylvanian and Mississippian), Devonian, Silurian, Ordovician and Cambrian.

palmer: a relative term used to describe a feature on the anterior portion of the hand; the side with the palm.

paracone: the mesial cusp located on the buccal side of the upper molar.

paraconformity: a break in the geologic record marked by a physical line separating a layer of sedimentary rock deposited over a parallel layer of sedimentary rock.

paraconid: the mesial cusp located on the lingual side of the lower molar.

parallel evolution: the evolution of similar morphologies in unrelated species as a result of adapting to similar environment and/or functions.

Paranthropus : ["the robust australopithecines"] a form of extinct hominins, possibly ancestral to human, that approximately dates from 2.5 million years ago to 700,000 years ago; fossil paranthropines show evidence of bipedalism and retain relatively small brains. Paranthropines differ from australopithecines in that they have a pronounced sagittal crest, relatively larger cranial capacity, immense mandibles and exhibit megadontia. The genus *Paranthropus* includes the species *P. aethiopicus*, *P. boisei* and *P. robustus*.

***Paranthropus aethiopicus*:** an extinct African hominin species, which possibly represents an early stage of paranthropine evolution, that approximately dates between 2.6 and 2.3 million years ago; fossil remains have been found in East Africa, and suggest a relatively small brain size, large molars and subnasal prognathism. The type specimen for *P. aethiopicus* is a fragmentary mandible from Ethiopia. The most famous *P. aethiopicus* fossil is The *Black Skull* (KNM-WT 17000) found in West Turkana and dates to approximately 2.5 million years ago.

***Paranthropus boisei*:** an extinct African hominin species that approximately dates from 2.5 million years ago to 1 million years ago; fossil remains have been found in East Africa. *P. boisei* exhibits a high degree of sexual dimorphism, a relatively small cranial capacity (*i.e.*, 500 cc), and specialized masticatory features: a flattened face, sagittal crest, flaring zygoma, very large mandible, and megadontia. The post-crania is very similar to australopithecines. The type specimen for *P. boisei* is OH 5 found at Oluvai Gorge and dates to approximately 1.8 million years ago.

***Paranthropus robustus*:** an extinct African hominin species that approximately dates from 1.8 million years ago to 1.2 million years ago; fossil remains have been found in South Africa. *P. robustus* exhibits a high degree of sexual dimorphism, a relatively small cranial capacity (*i.e.*, 530 cc), and specialized masticatory features: a flattened face, sagittal crest, relatively small incisors, very large cheek teeth, and a robust mandible. The post-crania is very similar to Australopithecines. The type specimen for *P. robustus* is TM 1517 found at Kromdraai and dates to approximately 2 million years ago.

parapatric speciation: the evolution of a daughter species from a small portion of individuals along a common border between two populations.

paraphyletic group: in cladistics, a clade (*i.e.*, group) that consists of a single common ancestor and some, but not all, of its descendants.

parietal: bones forming the sides and the roof of the skull.

parsimony: the idea that the simplest explanation is the most likely. In cladistics, parsimony states that the best representation of a relationship between species is that which depicts the least amount of evolutionary changes from the last common ancestor.

pastoralist: one who herds domesticated animals as a way of life.

pathology: the study of disease and disease processes.

pelvic inlet: the border of the pelvic cavity.

Pennsylvanian: a sub-period in the Carboniferous period on the geologic time scale that approximately dates from 325 million years ago to 300 million years ago; marked by the rapid evolution of plants, presence of reptiles, and the expansion of insects due to the spread of wetland forests.

perimortem: around the time of death.

period: an interval of geologic time shorter than an era and longer than an epoch.

Permian: a period in the Paleozoic era on the geologic time scale that approximately dates from 280 million years ago to 225 million years ago; marked by the formation of the Appalachian mountains, diversification of reptiles and amphibians, and many shallow marine animal extinction events.

phalangeal shaft curvature: the observed curve in the shaft of a phalanx (*i.e.*, finger bone).

Phanerozoic: [Greek: "visible life"] an eon that approximately dates from 545 million years ago and the present; marked as the time of living organisms; contains the Paleozoic, Mesozoic and Cenozoic eras.

phenotype: observable physical properties of an organism resulting from genes and the affects of the environment.

phyletic: in cladistics, a group that has a common ancestor.

phyletic classification: see *phylogenetic tree* or *phylogeny*.

phyletic gradualism: one of two competing models of evolutionary change that states adaptations occur gradually within a lineage or population. See also *punctuated equilibrium*.

phylogenetic tree: a hypothetical reconstruction of evolutionary relationships and times between groups.

phylogeny: an evolutionary lineage.

physical anthropology: the study of humans and the other primates from a biological and evolutionary perspective.

plantar: a relative term that describes features on the inferior portion of the foot; the sole.

plantarflexion: flexion of the foot toward the ground or distally. The foot is plantarflexed when you stand on the tips of your toes.

plate tectonics: the movement of the plates that form the earth's lithosphere (*i.e.*, the rigid crust and upper mantle) propelled by the convection current inside the molten lower mantle.

Pleistocene: an epoch in the Cenozoic era on the geologic time scale that approximately dates from 1.8 million years ago to 10,000 years ago; marked by the evolution of modern *Homo sapiens* and giant land mammals. The Pleistocene is the first epoch of the Quaternary period.

plesiomorphy: a primitive trait.

Pliocene: an epoch in the Cenozoic era on the geologic time scale that approximately dates from 5.3 million years ago to 1.8 million years ago; marked as the period of human evolution after the split from the ape lineage. The Pliocene is the last epoch of the Tertiary period.

pollex: the first finger; also known as the thumb.

polyandry: a mating relationship involving more than one male, but only one female.

polygamy: a mating relationship involving more than one male and more than female.

polygenic inheritance: refers to the shared common ancestor within a group of species.

polygyny: a mating relationship involving one male, but more than one female.

polyhedron: an angular tool with three or more working edges, which may intersect.

polymorphism: [adj. *polymorphic*] many forms.

polyphyletic group: in cladistics, a clade (*i.e.*, group) that consists of descendants, but not a common ancestor of those descendants; usually depicts *convergent evolution*.

- population:** a single organism or group of organisms of a single living species in a particular geographical area. The organism(s) living within a population are more likely to breed with members of their own population than they are with members of other populations.
- population genetics:** the study of how genes change in frequency within populations, often in response to natural selection.
- positional behavior:** the entire repertoire of positions that an animal engages in, including movement or locomotion (*i.e.*, leaping, walking, climbing, brachiation, etc.), and positions at rest or posture (*i.e.*, sitting, standing, hanging, feeding, sleeping, etc.).
- postcranial:** refers to the body below the cranium (*i.e.*, skull and mandible).
- postmortem:** the time frame after death.
- post-orbital bar:** the bony protuberance found on the side of the orbits on the skull that surrounds and protects the eye; found in most living primates and mammals.
- post-orbital constriction:** the narrowing bony portion behind the orbits of the skull; produced by a combination of having a large face and a small brain, and sometimes large temporalis muscles.
- Potassium-Argon (K-Ar) dating:** an absolute dating technique that measures the ratio of ⁴⁰Potassium (⁴⁰K) to ⁴⁰Argon (⁴⁰Ar) present in a sample.
- Precambrian:** a supereon on the geologic time scale that approximately dates from the formation of the earth (4.6 billion years ago) to 540 million years ago. The Precambrian makes up about 80% of the earth's history.
- prehensile:** grasping capabilities.
- premortem:** [syn. *antemortem*] the time frame before death.
- prepared core:** a prepared lithic with the outer cortex removed, and platforms for flaking typically prepared.
- pressure flaking:** a technique used to trim the edge of a tool, typically done with a sharp instrument made from bone or antler and pressure, rather than a strike, is used to generate a flake.
- primates:** in taxonomic classifications, a mammalian order that includes prosimians, monkeys, apes, and humans.
- primatology:** the study of primates.
- primitive trait:** a trait that is present in the ancestral form.
- process:** in anatomical terms, a projection from the bone.
- processing:** modification of the messenger RNA (mRNA) by adding a cap, a tail, and by splicing the RNA molecule through the elimination of the introns and leaving only the exons; the second part in the process of creating protein from genes.
- prognathism:** forward projection of the jaws beyond the rest of the face.
- pronation:** rotary motion that moves the thumb from the lateral to the medial position; the opposite of *supination*.
- protein:** the base for most of the body's structure that is made up of amino acids.
- Proterozoic:** [Greek: "before life"] an era on the geologic time scale that approximately dates from 2.5 billion years ago to 540 million years ago; marked by the formation and breakup of Rodinia and the evolution of the first metazoans; contains the Vendian or Ediacaran periods.

- protocone:** the mesial cusp located on the lingual side of the upper molar.
- protoconid:** the mesial cusp located on the buccal side of the lower molar.
- protuberance:** an elevation or raised deposition on the bone surface.
- proximal:** a relative term used to describe a part of a limb that is closer to the attachment point to the trunk of the body; the opposite of *distal*.
- pubis:** [plural: *pubes*] a bone of the os coxa that fuses into the ischium and ilium and forms the ventral and inferior component of the acetabulum.
- punctuated equilibrium:** one of two competing models of evolutionary change that states a population is generally unchanging, but may undergo occasional (short) periods of intense change. See also *phyletic gradualism*.
- quadrupedal:** a form of positional behavior (*i.e.*, posture and locomotion) that utilizes both the front and the hind limbs; an animal that locomotes on four legs is referred to as a quadruped. See also *arboreal quadrupedalism* and *terrestrial quadrupedalism*.
- quarry:** man-made pit in which part of the earth is excavated.
- Quaternary:** a period in the Cenozoic era on the geologic time scale that approximately dates from 1.8 million years ago to the present; marked as the period in which the genus *Homo* evolved; contains the Pleistocene and Holocene (recent) epochs.
- radiation:** in biology, the process of organisms dispersing into a new environment.
- radioactive decay:** the decay of an unstable parent isotope through one or many steps to a stable daughter isotope, releasing radioactivity as it decays.
- radioactivity:** the emission of radiation during radioactive decay.
- radiocarbon dating:** an absolute dating technique that measures the amount of ¹⁴Carbon present in a sample. See also *Carbon-14 dating*.
- radiometric dating:** an absolute dating method that measure the amount of radioactive decay in a sample.
- recessive allele:** an allele that is not expressed in the phenotype of an individual because it is masked by its dominant alternative.
- recombination:** the random distribution of parental chromosomes resulting in new gene combinations in the offspring.
- reduction:** decrease in size; the process by which raw materials are turned into lithic tools; this may involve hard or soft percussion (*i.e.*, striking) and/or pressure flaking.
- relative date:** a date assigned to an artifact or site based on the temporal relationship of surrounding materials. Relative dates can be established by determining the stratigraphic position of the item or identifying its evolutionary history; contrasts with *absolute dating*.
- replication:** the process by which a copy of DNA is made.
- reproductive advantage:** a feature that enables an organism of a breeding population to produce more offspring than other organisms in the same breeding population that lack that particular feature.
- reproductive isolation:** the inability of two populations of a species to successfully interbreed. The most common reason for reproductive isolation is geographic separation. For example, two groups of one species may be separated from one another by a river.

reproductive success: the contribution of genes to the next generation.

resharpening: the process by which a worn stone tool, such as a biface, is reflaked to provide a new, sharp cutting surface.

resorption: the destruction of bone by osteoclasts.

reworking: the process by which a stone tool or flake is reflaked into a new shape or tool type.

ribonucleic acid: an important molecule found within the chromosomes that does not carry genetic information, but assists in the duplication of DNA; a nucleic acid made up of a series of four bases (adenine, guanine, thymine and uracil), a ribose sugar and a phosphate group.

rift: a place where the Earth's crust and lithosphere are being pulled apart as a result of plate tectonics.

rift valley: a long narrow valley surrounded by faults on either side. Numerous primate and hominid fossils have been found in the East African Rift System.

riparian: describes a region bordering a river.

river bed: ground area surrounding the path of a river.

RNA: the abbreviation for ribonucleic acid.

robust: a rugged build; usually characterized as being large bodied and/or having heavily-structured anatomy; the opposite of *gracile*.

Rodinia: [Russian: "Homeland"] a late Proterozoic super-continent that approximately dates from 1 billion years ago to 700 million years ago; during this time, life consisted mainly of single celled-organisms and the oceans were at approximately 95 percent of their present volume.

sacrum: formed by the fusion of five sacral vertebrae; the part of the vertebral column that forms the most dorsal part of the pelvic girdle, in between the os coxae.

sagittal crest: a protrusion made of bone at the joint between the parietal bones to which the temporalis muscles attach; common in many larger ape species and some fossil hominins.

Sahelanthropus tchadensis: an extinct hominin species that existed in Africa approximately 7 to 6 million years ago; fossil remains found at Toros-Menalla, locality TM 266, in Chad, suggest that *Sahelanthropus tchadensis* may have been bipedal; this find also led to the reevaluation of the chimp-human divergence time frame.

savanna: [alt. *savannah*] an environment usually located near woodlands that consists of grasses, a few trees, and shrubs; also vegetation can be located below the ground in the form of tubers and roots; strong seasonality and reduced rainfall; animal life not as diverse as in other environments, but typically inhabited by a high number of herbivores, carnivores and insects. Baboons and humans are the only primates known to inhabit savannas.

scavenging: a behavior that allows animals to incorporate meat into the diet, but one that relies on finding the carcasses of animals that died of natural causes or were killed by other predators, rather than engaging in active predation.

science: a process that studies the natural world and tests the accuracy of the results. Science's primary utility comes from its self-correcting nature, as erroneous ideas are discarded.

scientific law: a scientific statement or description of a fact that has been supported to be true by all available means of the scientific method. A scientific law explains behaviors or phenomena when specific conditions are applied.

scientific method: the process used by scientist to answer or clarify scientific inquiries. The process begins with the formation of a hypothesis based upon observation, followed by further systematic observations and experiments related to the phenomenon in question. These experiments and observations are conducted several times to establish whether the results are repeatable. The repeatable results are then used to support or disprove the initial hypothesis.

scraper: the dominant tool used during the Middle Paleolithic mainly used for scraping; includes the notched scraper, side-scraper, steep-sided scraper, and core-scraper.

sedentary: to remain in or near a home range.

sedimentary rock: when clays, silts, or sands compact over long periods of time, eventually forming into a hard element.

semiarid: describes a region with low annual rainfall and predominantly short vegetation, such as shrubs and grasses.

sexual dimorphism: the condition in which the males and females of a particular species each have different forms of the same feature or characteristic (*e.g.*, body size, canine size). In those primate species that display marked sexual body size dimorphism, the males are larger than the females. In some species, such as gorillas and orangutans, the males are twice as large as the females (*i.e.*, a 2:1 difference in mass).

sexual selection: a form of natural selection where fitness is determined by an individual's ability to compete for mates.

shared derived character: a new trait common between evolutionary related groups or individuals.

Silurian: the third period in the Paleozoic era on the geologic time scale that approximately dates from 440 million years ago to 400 million years ago; marked by presence of large coral reefs, massive evolution of fish, and the first appearance of terrestrial plants.

simian: refers to monkeys, apes, and humans.

single-species hypothesis: the theory that only one hominin species has lived at any one time. The idea behind this theory is that all hominins would have occupied the same ecological niche and therefore could not have existed together. Later discoveries have proved the single-species hypothesis to be false.

sister group: a group that shares the same common ancestor with another.

site: an accumulation of artifacts or fossils at a single location that is limited in spatial and stratigraphic extent. Some sites represent the activities of a single event (*e.g.*, the butchery of a single animal) while other sites represent multiple activity cycles carried out by many individuals over time. Interpreting what sorts of activities are represented at a site is one of the primary goals of an archaeologist.

skeleton: the protective and supportive structure of an organism constructed of bone and cartilage.

skull: the bony portions of the head, including the cranium and the mandible.

speciation: the evolution of a new species from an ancestral species; the foundation of macroevolution.

species: the basic unit of biodiversity. Individuals of a species are reproductively isolated, meaning that they cannot produce viable offspring with a mate of a different species. Taxonomic classification uses the binomial nomenclature: where the names of organisms start with a capitalized genus name (*i.e.*, *Homo* for humans) and a specific epithet for the species name (*i.e.*, *sapiens* for humans). Therefore, the proper species name for humans is *Homo sapiens*.

spheroid: round stones which may have been shaped by smoothing. An example of spheroids are bolas, rounded stones used as throwing weights in weapons that snare game by entangling the legs.

stabilizing selection: when the extreme variants are selected against, increasing the mean.

stasis: a period in which a species undergoes little to no morphological or behavioral changes; evolutionary stability.

statistical inference: an inference that is replicable and uniform.

statistical significance: a decision about validity, usually an estimate of the probability that the predictions were fulfilled by chance events.

stone tool: tools made of stone that enabled hominins to exploit a broader range of activities such as food processing. Through time, stone tools made and used by hominins became more complex and forms became standardized as new manufacturing techniques were invented.

stone tool technological Mode I: simple unstandardized flakes, cores and choppers; produced during the Lower Paleolithic. The Oldowan tool industry is an example of Mode I stone tools.

stone tool technological Mode II: standardized flakes and other artifacts as a result of direct percussion techniques; typically associated with *Homo erectus*; produced during the Lower Paleolithic. The Acheulean tool industry is an example of Mode II stone tools.

stone tool technological Mode III: standardized blades and burins; produced during the Middle Paleolithic; typically associated with *Homo neanderthalensis* and possibly modern *H. sapiens*. The Mousterian tool industry is an example of Mode III stone tools.

stone tool technological Mode IV: standardized blades and burins; produced during the Upper Paleolithic.

stone tool technological Mode V: the production of microliths; produced during the Upper Paleolithic.

stone tool technological Mode VI: the production of polished (ground) stone tools and pottery and a wide variety of lithics, with a continued emphasis on blades; produced during the upper Paleolithic.

stone tool technological Modes: a system of classifying stone tool technology into six modes based on the complexity of the tool manufacturing technique; formulated by J.G. D. Clark in 1969.

stratigraphy: the study of strata, or the layers of sediments deposits onto the ground, and the fossils that are found within these layers.

superior: a relative term used for bipedal hominins (those that travel on two legs) to describe features on the trunk that are closer to the head; the opposite of *inferior*. The term *cranial* is a synonym commonly used when referring to quadrupedal animals.

supernumerary: an extra element.

superposition: the idea that the top layer of sediments is younger than the sedimentary layer below it.

supination: rotary motion that moves the thumb from the medial position to a lateral position; the opposite of *pronation*.

suspensory behavior: a form of positional behavior in which the body of an organism is supported by their arms or legs holding on to a branch above them; the tail may also be used in suspensory posture.

suture: a joint between two bones that are securely connected and are separated by fibrous tissue. The joints between most of the bones of the skull are sutures.

symbol: an object, behavior, or language that stands for something else and carries some codified meaning.

sympatric speciation: the evolution of a daughter species due to changes within a subset of the parent population; in this sense, the parent and daughter populations are not geographically isolated from one another.

sympatry: when the home range of two different species overlaps.

symphysis: a type of joint that is cartilaginous.

symplesiomorphy: a shared primitive trait.

synapomorphy: a shared derived trait.

systematics: the science of classification; the organization of organisms according to their evolutionary relationships.

talonid: the extraneous area formed by the entoconid, the hypoconid and sometimes the hypoconulid on the distal portion of the lower molar.

taphonomy: the study of the events and conditions that led to the fossilization and preservation of a particular specimen or assemblage of specimens.

Taung Child: the common name for specimen Taung 1; the type specimen for *Australopithecus africanus*; the first australopithecine fossil ever identified. The Taung Child is a fossilized juvenile skull with a preserved brain endocast that dates between 3 and 2.5 million years old; found in a rock quarry in 1924 by Raymond Dart, it was named *A. africanus* (*i.e.*, "African southern ape"). Dart argued that the Taung Child was bipedal based on the inferior placement of the foramen magnum. The Taung Child changed scientific understanding of human evolution. Prior to Taung's discovery, scientists believed larger brains evolved before bipedalism. Taung help to establish that the first bipedal hominins were small statured and small brained individuals.

taxon: a category (*e.g.*, species, genus, family, and order) in the classification of organisms.

taxonomy: the process of applying appropriate and correct names for organisms, usually, but not always, on the basis of evolutionary relationships.

tectonic activity: activities that can be attributed to moving of the earth's tectonic plates, including earthquakes, volcanic eruptions, continental rifting, etc.

temperate zone: the region north of the Tropic of Cancer (23.5 degrees north latitude) or south of the Tropic of Capricorn (23.5 degrees south latitude).

temporal: located at the lateral base of the skull; surrounded the external ear.

temporal foramen: the space bounded by the cranium (medially) and the zygomatic arch (laterally) through which the temporalis muscle passes to its insertion on the coronoid process of the mandible.

temporal fossa: the space (or depression) on the skull occupied by the temporal muscle.

terrestrial: ground.

terrestrial quadrupedalism: a mode of locomotion in which the animal moves along the ground with a regular gait pattern involving all four limbs. See also *arboreal quadrupedalism*.

territory: part of an organism's home range that is defended against invasion by other groups, particularly those of the same species.

Tertiary: a period in the Cenozoic era on the geologic time scale that approximately dates from 65 million years ago to 1.6 million years ago; includes the Paleocene, Eocene, Oligocene, Miocene and Pliocene epochs.

Tethys Sea: a sea that separated the northern (*i.e.*, Laurasia) and southern (*i.e.*, Gondwana) portions of Pangea that approximately dates between 280 million years ago and 55 million years ago; marked by its biodiversity.

- theory:** a tested hypotheses that describes an observable fact or facts. A theory usually consists of an abundance of related ideas and explanations verified to be true through various and repeatable experiments and observations.
- thoracic vertebrae:** the section of the vertebral column where the ribs attach. Modern humans have twelve thoracic vertebrae.
- thorax:** the chest region that usually houses the lungs, heart, esophagus and related structures.
- trabecular bone:** an interior web of bone that acts to reinforce the bones strength and stability; typically found near the ends of long bones and in between the cortex of flat bones. The structure of trabecular bone can be studied to determine an animal's habitual physical behaviors.
- trace fossil:** evidence of an animal's activities preserved in the fossil record; may consist of preserved footprints, tunnels, coprolites, tracks, etc.
- transcription:** the production of a single strand of messenger RNA (mRNA) from a double-stranded sequence of DNA; the first part of the process of creating proteins from genes.
- transitional fossil:** a fossil that exhibits primitive features of an ancestral species and the derived features of a descendant species.
- translation:** the conversion of messenger RNA (mRNA) into a chain of amino acids that make up a protein that is coded for by the gene; the final step of the process of creating proteins from genes.
- translocation:** when a piece of a chromosome gets detached and is reattached in an inappropriate chromosome, resulting in a mutation.
- Triassic:** a period in the Mesozoic era on the geologic time scale that approximately dates from 245 million years ago to 200 million years ago; marked by presence of the first dinosaurs and mammals, and the diversification of shelled cephalopods.
- trigon:** the triangle formed by the protocone, paracone and metacone on the upper molar.
- trigonid:** the triangle formed by the protocone, paracone and metacone on the mesial portion of the lower molar.
- trisomy:** having three copies of a specific chromosome instead of two.
- tropical zone:** the region between the Tropic of Cancer (23.5 degrees north latitude) and south of the Tropic of Capricorn (23.5 degrees south latitude).
- trunk:** the torso of the body; place where appendages, head and/or tail attach.
- tuberosity:** a rugged or robust protuberance on a bone.
- tuff:** sediments deposited by volcanic ash after an eruption.
- type specimen:** one individual specimen that is used as the representative for a species
- unconformity:** large breaks in the sedimentary rock record that can be used to measure long periods of geologic time.
- uniface:** a stone tool that has been worked only on one side (face).
- uniformitarianism:** a principal in geology that states that all natural laws are constant, that the present processes of today are the same as those acted in the past, that geologic change is slow and of a uniform rate, and that the earth is fundamentally the same today as it was at the time of its formation; proposed by Charles Lyell (1797-1875).

Upper Paleolithic: [syn. *New Stone Age* or *Neolithic*] the time period of tool approximately dated between 40,000 years ago to the present; tools associated with this time period deal with plant domestication and agriculture, and more diverse in their manufacture and utility than seen in previous eras.

valgus knee: the angulations of the femur such that the knees are closer together than the hip joints.

Vendian: a period in the Proterozoic era on the geologic time scale that approximately dates from 610 million years ago to 570 million years ago.

ventral: a relative term used for quadrupedal animals (those that travel on four legs) to describe features that are closer to the belly or front of the body; opposite of *dorsal*. The term *anterior* is a synonym commonly used when referring to bipedal hominins. For the hand, *palmar*, and for the foot, *plantar*, are synonyms for ventral.

vertebrate: an animal with a vertebral column (*i.e.*, backbone).

vertical clinging and leaping: a mode of locomotion in which an animal clings and/or leaps between vertical supports.

vestigial feature: a character inherited through many generations that has no function. For example, the human coccyx (*i.e.*, tail bone) is the morphological remnants of a tail.

weathering: change to the earth's surface due to exposure to atmospheric agents.

Wernicke's area: the area of the brain that is used for understanding speech.

woodland: an environment usually separated by grasslands and located near forests that consists of mixed trees, shrubs and grasses; vegetation is found at all vertical levels; seasonal conditions; typically inhabited by a few small arboreal animal species (*e.g.*, chimps and baboons) and a high number of large mammals and folivores.

x-chromosome: the female sex chromosome.

Y-5 molar: a cusp pattern seen in lower molars where the two buccal grooves (*i.e.*, the groove between the protoconid and the hypoconid, and the groove between the hypoconid and the hypoconulid) form the arms of the "Y", and the lingual groove (*i.e.*, the groove between the metaconid and the entoconid) forms the step of the "Y"; believed to be the primitive condition in hominins.

y-chromosome: the male sex chromosome.

Zhoukoudian: a paleontological and archaeological site located near Beijing, China, consisting of a cave system; nicknamed "Dragon Bone Hill" for the numerous fossils produced. This site is well known for the excavations in the 1920s which produced a specimen of *Homo erectus* nicknamed "Peking Man."

Zinjanthropus: the name originally given to the type specimen OH-5 by Dr. Louis and Mary Leakey. See also *Paranthropus boisei*.

zooarchaeology: the study of animal remains in archaeological sites; reveals important information about the behaviors of the hominins who produced the sites.

zygomatic arch: [syn. *malar*] the "cheekbone"; an arch of bone on the side of the face just below and behind the eye; the superior attachment surface for most of the muscles that form the cheeks. The zygomatic arch is constructed anteriorly from part of the maxilla, and posteriorly from a projection of the zygomatic bone.

zygomatic flare: describes the degree of lateral extension of the zygomatic arches.