I'm not a bot

Ecosystem n., plural: ecosystems ['iːkəʊˌsɪstəm] Definition: A system that includes all living organisms (biotic factors) in an area as well as its physical environment (abiotic factors) functioning together as a unit. An ecosystem is a system consisting of biotic and abiotic components that function together as a unit. The biotic components include all the living things whereas the abiotic components are the non-living things. Thus, an ecosystem science definition entails an ecological community consisting of different populations of organisms that live together in a particular habitat. Natural sciences like ecology and geography define an ecosystem as a geographic area where organisms, weather, and landscape, work together to form a “bubble of life”. (Ref. 1) How about in biology, what is an ecosystem? In essence, the ecosystem definition in biology is that it acts as the fundamental unit of nature. (Ref. 2) Just as a living organism is made up of cells that act as the structural and functional units of life, nature also consists of fundamental units called ecosystems. What is a simple definition of an ecosystem? An ecosystem is a community plus the environment. Ecology, which is the scientific study of the interactions between populations or between organisms and the environment, can be viewed at the level of an individual, a population, a community, or an ecosystem. Ecology at the level of individuals is concerned chiefly with the individual organism’s physiology, reproduction, and development. At the level of population, ecology deals primarily with the attributes and the various factors affecting the population. At the level of community, ecology studies the interactions between populations and community patterns. At the level of an ecosystem, ecology puts all of them together to understand how the system operates as a unit. Thus, an ecosystem ecology would be more concerned about energy flow and nutrient cycles than about individual species. (Ref. 3) Etymologically, the ecosystem meaning and origin can be traced back to the Ancient Greek “οἶκος” (“oîkos”) for “house” and “σύστημα” (“sústēma”) for “organized body”. The term was coined in the early 1930s by the botanist, Roy Clapham, to denote the physical and biological components of an environment. However, it was the British Ecologist, Arthur Tansley, who first introduced the concept in his paper entitled “The Use and Abuse of Vegetational Concepts”. (Ref. 4, 5) Synonyms: environs; ecological community. Ecosystem Structure The structure of an ecosystem consists of two major components: (1) biotic components (2) abiotic components Two components of the ecosystem: Biotic and Abiotic. Image by Maria Victoria Gonzaga for Biology Online (1) Biotic components The biotic components include all living things. There are two major types of living things. They are the eukaryotes and the prokaryotes. Eukaryotes are characterized by having membrane-bound organelles (such as a nucleus) inside their cells. The prokaryotes, in turn, are those lacking membrane-bound organelles. For further differences between these two groups, read this). Examples of eukaryotes are plants, animals, fungi, and protists. Bacteria and archaea represent the prokaryotes. Now, each of them has a “job” to do in the ecosystem. Plants, for instance, have chloroplasts that enable them to harvest light energy. Then, they take carbon dioxide and water from their environment to convert them into sugar, a biomolecule that can be used to synthesize chemical energy (such as ATP). Because they are capable of producing their own food through photosynthesis, they are referred to as the producers. Next to the producers are the primary consumers. They feed on the producers while they serve as a food source to the higher levels of consumers (e.g. secondary and tertiary). The animals are examples of consumers. The animals that feed on plants are called herbivores whereas those that feed on other animals are carnivores. Then, there are those that feed on both plants and animals. They are called omnivores. (2) Abiotic components The abiotic components include all the non-living things, such as rocks, soil, minerals, water sources, and the local atmosphere. Similar to biotic components, the abiotic components also have their ecological role. For example, elements and compounds serve as sources of nutrients. They are essential to the growth and metabolism of an organism. Apart from providing nutrients, they also provide organisms a place to live and thrive — a habitat. Interactions The biotic and the abiotic components interact with one another as a system and are linked to one another via nutrient cycles and energy flows. For instance, energy and nutrients enter the system via the photoautotrophs. They are organisms that carry out photosynthesis, such as plants and green algae. Then, the heterotrophs, for example, animals, feed on the photoautotrophs. This makes the energy and the nutrients move through the system. The death of these organisms incites decomposition by the decomposers. This process releases the nutrients back to the environment to be re-used by the organisms. To learn more about this, proceed to: Processes of the Ecosystem. The biotic and abiotic components can also serve as environmental (ecological) factors that affect the ecosystem. The biotic components whose biological activity creates an impact on the ecosystem are referred to as the biotic factors. The abiotic factors, in turn, include the non-living things and the physical aspects of an ecosystem, such as climate, temperature, and pH. An example of a biotic factor is the extent of predation in an ecosystem. If there is an increase in the number of predators, predation activity would likely increase. This, in turn, could significantly lessen the population density of their prey. If their prey is a key species, meaning another group of organisms depends on them for survival, then the decline (or worse, the extinction) of these key species could also lead to the decline (or worse, the extinction) of the organisms relying upon them. As for the abiotic factor, they can regulate the size or the density of a species population. For instance, acid rain, which is unusually acidic precipitation and has high levels of hydrogen ions, can produce detrimental effects on the soil (e.g. leaching) as well as on the plants and aquatic animals that are sensitive to low pH. Apart from pH, other abiotic factors are light, salinity, air, soil or substrate, and temperature. Types of Ecosystems What are the 4 types of ecosystems? The four types of ecosystems are terrestrial, freshwater, marine, and artificial. The first three occur naturally in various biomes. The last one is man-made. Ecosystems vary in size — from the micro-ecosystems (e.g. tree ecosystems) to the largest ecosystems such as ocean ecosystems. (1) Terrestrial ecosystem The terrestrial ecosystem occurs on land. Examples of land-based ecosystems are forest ecosystems, grassland ecosystems, tundra ecosystems, and desert ecosystems. A forest ecosystem consists of various plants, particularly trees. Because of the abundance of plants that serve as producers, this ecosystem abounds in life. Not only plants but also animals are teeming in a forest. They are also a great source of fruits and wood, They also help maintain the earth’s temperature. They are also a major carbon sink. (Ref.6) Grassland ecosystems are typically found in tropical or temperate regions. They are dominated by grasses. As such, the animals commonly found in this type of ecosystem are grazing animals, such as cattle, goats, and deer. Tundra ecosystems are characterized as being treeless and snow-covered. The snow melts briefly in spring and summer, producing shallow ponds. During this time, lichens and flowering plants typically grow. Because of the ice that covers the land in the tundra, this type of ecosystem is important in regulating the earth’s temperature. It also serves as a water reservoir (in the form of ice or frost). Desert ecosystems are the ones occurring in desert habitats. Deserts are typically arid and windy. Some of them contain dunes, others, mostly rock. Organisms in the desert are not as diverse as those in forests but they possess adaptations that make them suited to their environment. Plants that are commonly found in the desert are CAM plants, such as cacti. Desert animals include insects, reptiles, and birds. (Ref.7) (2) Freshwater ecosystems Freshwater ecosystems are aquatic ecosystems that do not contain saltwater. They are home to algae, plankton, insects, amphibians, and fish. There are two major types: lentic and lotic ecosystems. A lentic ecosystem refers to ecosystems in still waters. Examples include the following: ponds, puddles, and lakes. Lakes, in particular, may form zonation. That is when it becomes very well established that different zones are formed. These zones are as follows: littoral, limnetic, and profundal. The littoral zone is the part that is near the shore. Here, light can penetrate up to the bottom. The limnetic zone is the zone in which light does not completely penetrate through. The part of the limnetic zone that is penetrated by light is the photic zone whereas the zone in which light cannot penetrate through, and therefore is dark, is the benthic zone. The plants and animals vary in these zones. For instance, rooted plants are found in the littoral zone but not in the limnetic zone. Rather, freely-floating plants are the ones commonly seen on the surface of the limnetic zone. A lotic ecosystem is an aquatic ecosystem characterized by a freshwater habitat that is freely flowing. That is as opposed to the lentic, which is nearly stationary. Examples include rivers and streams. Many plants and animals in these ecosystems have adaptations to help them cope with the force and the different conditions that running water brings. (3) Marine ecosystem A marine ecosystem is an aquatic ecosystem that contains saltwater. Examples are the ecosystems in the seas and oceans. The ocean ecosystems, in particular, are an important source of atmospheric oxygen due to the vast population of autotrophic algae that release oxygen through photosynthesis. Marine ecosystems are regarded as the most abundant type of ecosystem in the world. (Ref.7) (4) Artificial ecosystem An artificial ecosystem is a man-made system, which can be further classified as terrestrial, freshwater, or marine. An example of an artificial ecosystem is a terrarium. Many man-made ecosystems are built for conservation purposes, aesthetics, and studying biology and ecology. Processes of the Ecosystem In an ecosystem, energy flows while materials are cycled. These two processes are linked and essential to the structure, function, and biodiversity of an ecosystem. Let’s take a look at the figure below to understand them further. Figure 1: While some energy is stored in ATP others are released as heat. The heat, dissipated into the environment is lost in the system and cannot be recycled. This means the planet is an open system when it comes to energy. (Ref.3) Image prepared by Maria Victoria Gonzaga for Biology Online. In ecology, the term productivity refers to the rate of generation of biomass in an ecosystem. It is often expressed in units of mass per volume per unit of time, e.g. grams per square meter per day ($g\ m^{-2}\ d^{-1}$). Productivity may be primary or secondary. Primary productivity refers to the productivity of the autotrophs, such as plants, whereas secondary productivity refers to that of the heterotrophs, such as animals. (Ref. 8) The primary production of biomass is often attributed to plants and algae performing photosynthesis. That is because virtually all energy available to organisms starts with them. (Ref. 3) Energy from the sun is captured by the chloroplasts (organelles containing chlorophyll, the green pigment) inside the cells of photoautotrophs. Inside the chloroplast, the light energy (in the form of photons) drives the conversion of inorganic substrates into energy reserves, like sugar molecules. In general, animals have no such pigments to capture light energy that will enable photosynthesis. Therefore, they have to rely on autotrophs and/or other heterotrophs for food. Photosynthesis is a biological process through which plants manufacture their own food with the aid of light from the sun and inorganic sources (e.g. carbon dioxide and water). They produce glucose molecules, for instance, that can be stored later as starch. The plants, in turn, serve as a food source for organisms that are incapable of producing their food. By feeding on these plants, the energy (as well as the nutrients) flows from the producer to the consumer. Then, it flows from one consumer to the next. Complex organic molecules in food, such as carbohydrates, fats, and proteins are rich sources of energy stored in their chemical bonds. In the presence of oxygen, glucose (a sugar molecule), for instance, is processed to synthesize chemical energy (ATP) via cellular respiration. Energy stored in food molecules is released through a series of oxidation reactions. Electrons are passed on from one molecule to another until they reach the final electron acceptor, which is oxygen. As the food molecule is fully oxidized, the final byproduct is carbon dioxide, which is released, for example through transpiration in plant stomata and exhalation in breathing animals. In the absence of oxygen, cells carry out fermentation wherein glucose is broken down to generate ATP and produce lactic acid. In animals, the excess energy from dietary sources is stored in energy-rich molecules, such as glycogen and lipids. Decomposers are the last group of organisms through which energy flows through. They consume the droppings and carcasses of all living things. Look at the figure below. It shows a simple diagram of a food chain and the flow of energy and nutrients. It starts with the producers, such as plants, that manufacture food by capturing light energy from the sun. Energy flows next to the consumers, particularly the primary consumer (insects), the secondary consumer (frog), the tertiary consumer (snake), and lastly, to the quaternary consumer (eagle). Then, the droppings or the carcass of the eagle will be broken down by the decomposers. Figure 2: a simple diagram of a food chain and the flow of energy and nutrients. Image provided by Maria Victoria Gonzaga for Biology Online Elements, such as carbon, nitrogen, or phosphorus, enter a living organism in different ways. One example is by plants directly taking them up from their physical environment, for example via roots absorbing elements available in the soil and gases entering through stomata. In animals, these elements enter via food consumption. Droppings and decaying organic matter are broken down by decomposers, ultimately releasing these elements for nutrient cycling, or for use by other living organisms. This ecological process in which decomposers break down organic matter by decomposers is called decomposition. In decomposition, these materials are neither lost nor destroyed, and therefore the planet, in this regard, is a closed system. The elements will be cycled between biotic and abiotic states within the ecosystem. (Ref. 3) Figure 3: This figure illustrates the various biogeochemical or nutrient cycling carried out by decomposers. Credit: Cavicchioli, R., et al. (2019) “Scientists’ warning to humanity: microorganisms and climate change”. Nature Reviews Microbiology, 17: 569–586. doi:10.1038/s41579-019-0222-5, CC BY-SA 4.0. Ecosystems are dynamic. Their composition and structure may change over time especially when a disturbance occurs. For example, a volcanic eruption is a natural disturbance that can create a new land that is open for colonization. Oftentimes, the first species to colonize a barren land are lichens. Eventually, their biological activities will alter the condition of the environment. This will make it less harsh and more habitable for new species. The progressive replacement of one dominant type of species or community by another is called succession. This succession will go on until a climax state is established, meaning the ecosystem has achieved stability and no further successions will occur unless another disturbance disrupts the ecological balance. For example, a massive flood wiped out a previously stable community. The land will be open again for colonization. A succession in which the new land is colonized for the first time is referred to as primary succession whereas a succession in an area that was previously occupied by a community but was disturbed and replaced by recolonization is called secondary succession. Take a look at the schematic diagram of succession below. You will notice that the process started as a barren land with bare rocks. The pioneer species, like lichens and moss, will grow on the rocks and will become the pioneer species. Then, the site is next colonized by grasses and herbaceous plants. Soon, trees will grow on this site when their seeds reach the site, for example by wind currents or by bird droppings containing undigested seeds. Figure 4: Notice the progressive replacement of one dominant type of species or community. This is called ecological succession. Ecosystems are responsible for the cycling of nutrients and for allowing the flow of energy, such as from the sun to the biotic components. The various biological, physical, and chemical systems work together in maintaining the stability of these systems on earth. Biodiversity is essential for an ecosystem to function. Biodiversity refers to the biotic components. The more diverse the biotic components are, the “healthier” the ecosystem will be. That is because each species has an important role to play. The more diverse the species are, the greater is the chance that the ecosystem will persist and continue to function. High diversity in an ecosystem can help improve productivity and thereby stabilize the functioning of an ecosystem. Examples of Ecosystem Examples of ecosystems described here are the following: Deciduous forest ecosystem Savannah ecosystem Coral reef ecosystem Hot spring ecosystem Micro-ecosystems Deciduous forest ecosystem Deciduous forest A deciduous forest is dominated by trees that shed leaves seasonally and then regrow their leaves at the start of the new growing season. They shed leaves as an adaptive mechanism against the cold season in temperate regions or the dry seasons of the subtropical and tropical regions. The dominant trees in mid-latitude are oaks, beeches, birches, chestnuts, aspens, elms, maples, and basswoods. (Ref. 9) In the Southern Hemisphere, the dominant tree is the genus Nothofagus (southern beeches). The animals commonly found are snakes, frogs, salamanders, turtles, snails, slugs, insects, spiders, birds (such as warblers, owls, woodpeckers, hawks, etc.), and mammals (such as mice, moles, chipmunks, rabbits, weasels, foxes, and deer). (Ref. 9) Savannah ecosystem Savannah Savannahs are a mix of woodland and grassland ecosystems. The widely spaced, scattered canopy trees allow light to penetrate and reach the ground. Because of that, shrub and herbaceous layers dominated by grasses can grow abundantly as well. Thus, the animals commonly found here are the grazers, such as sheep, cattle, and goats. This type of ecosystem often serves as a transition zone between forest and desert or grassland. Coral reef ecosystem Coral reef The coral reef is an ecosystem created by reef-building corals. The reefs are colonies of coral polyps, such as stony corals that live together in clusters. They are one of the most diverse ecosystems on earth. As such, they are referred to as the rainforests of the sea. Most of them are found at shallow depths in tropical waters. Some of the species that inhabit the reefs are mollusks, worms, crustaceans, echinoderms, sponges, tunicates, and fish. Hot spring ecosystem Yellowstone hot spring A hot spring is a spring with water temperatures that are higher relative to its surroundings. The water that is coming out of the spring is heated geothermally, i.e. via the heat from the earth’s mantle. Because of the high temperature, it is one of the ecosystems that contain very few types of organisms. Thermophiles are organisms that can thrive at temperatures ranging from 45 to 80°C (113 and 176 °F). Some of these organisms are thermophilic amoeba (such as Naegleria fowleri and Acanthamoeba), thermophilic bacteria (e.g. Legionella), and various archaea. Micro-ecosystems A tree with a creeping fern (epiphyte) Ecosystems confined to tiny spaces and yet defined by specific environmental factors are called micro-ecosystems. Let’s take a look at a tree ecosystem. A tree creates a small ecosystem where various kinds of organisms live. For example, a tree may harbor lichens and other epiphytes (arboreal plants), invertebrates (such as insects), amphibians, and other animals. The epiphytes, themselves, provide a habitat for other organisms, such as fungi, bacteria, and myxomycetes. (Ref. 10) NOTE IT! Beavers — The Awesome Engineers of the Ecosystem Have you heard of an “ecosystem engineer”? While we are familiar with the engineers and architects of our society, there are other living beings worthy of such an esteemed title with their awesome infrastructures in nature. Among these awesome master builders on Earth are the beavers! Beavers construct beaver dams across a stream or river using tools that nature endowed them with! With the gnaw of their teeth and the slap of their tails, they build an astounding framework of tree branches, twigs, logs, sticks, grasses, rocks, and mud, which subsequently form a beaver pond upstream. As the water starts to gather, they then build within the beaver pond a dome-shaped lodge with multiple chambers — one for nesting, another for food, an air chamber for breathing, and a chamber for entry or escape. Within the beaver lodge, a family of beavers can stay to nurse and raise their young and hide from large predators like coyotes or wolves. And similar to affixing signatures to be identified as the “architect and engineers” of an impressive feat, beavers scent mark their monumental work and their territory with their exudate (called castoreum) from their castor sacs near the base of the tail. While beaver dams give them a secure space to live, these structures also play a role in orchestrating the flow of streams or rivers and in generating a new kind of habitat for other species. Master builder beavers are, thus, regarded as “keystone species” for their crucial role in the ecosystem. While they alter their environment and shape landscapes, their architectural feat leads to the creation of wetlands and meadows where diverse plants and animals can benefit and thrive. Source: Build a Beaver Dam (U.S. National Park Service). (2022). Nps.gov. LINK Answer the quiz below to check what you have learned so far about ecosystems. References National Geographic Society. (2011, August 15). Ecosystem. National Geographic Society. Mathematics and 21st Century Biology. (2005). National Academies Press. The Concept of the Ecosystem. (2017). Umich.Edu. Willis, A. J. (1997). “The ecosystem: an evolving concept viewed historically”, Functional Ecology 11:2, page 268-271. Möller, D. (2020). Chemistry of the Climate System. Berlin Boston: De Gruyter. Admin. (2018, March 13). Ecosystem. BYJUS; BYJU’S. 10 Examples of a Natural Ecosystem. (2017). Sciencing. Wikipedia Contributors. (2020, July 31). Productivity (ecology). Wikipedia; Wikimedia Foundation. ecology) deciduous forest | Definition, Climate, & Characteristics | Britannica. (2020). In Encyclopædia Britannica. Sydney E. Everhart; Joseph S. Ely; Harold W. Keller (2009). “Evaluation of tree canopy epiphytes and bark characteristics associated with the presence of corticolous myxomycetes” (PDF). Botany. 87 (5): 509–517. ©BiologyOnline. Content provided and moderated by BiologyOnline Editors. “An ecosystem is defined as a community of lifeforms in concurrence with non-living components, interacting with each other.” What is an Ecosystem? An ecosystem is a structural and functional unit of ecology where the living organisms interact with each other and the surrounding environment. In other words, an ecosystem is a chain of interactions between organisms and their environment. The term “Ecosystem” was first coined by A.G.Tansley, an English botanist, in 1935. Read on to explore the structure, components, types and functions of the ecosystem in the notes provided below. Structure of the Ecosystem The structure of an ecosystem is characterised by the organisation of both biotic and abiotic components. This includes the distribution of energy in our environment. It also includes the climatic conditions prevailing in that particular environment. The structure of an ecosystem can be split into two main components, namely: Biotic Components Abiotic Components The biotic and abiotic components are interrelated in an ecosystem. It is an open system where the energy and components can flow throughout the boundaries. Biotic Components Biotic components refer to all living components in an ecosystem. Based on nutrition, biotic components can be categorised into autotrophs, heterotrophs and saprotrophs (or decomposers). Producers include all autotrophs such as plants. They are called autotrophs as they can produce food through the process of photosynthesis. Consequently, all other organisms higher up on the food chain rely on producers for food. Consumers or heterotrophs are organisms that depend on other organisms for food. Consumers are further classified into primary consumers, secondary consumers and tertiary consumers. Primary consumers are always herbivores as they rely on producers for food. Secondary consumers depend on primary consumers for energy. They can either be carnivores or omnivores. Tertiary consumers are organisms that depend on secondary consumers for food. Tertiary consumers can also be carnivores or omnivores. Quaternary consumers are present in some food chains. These organisms prey on tertiary consumers for energy. Furthermore, they are usually at the top of a food chain as they have no natural predators. Decomposers include saprophytes such as fungi and bacteria. They directly thrive on the dead and decaying organic matter. Decomposers are essential for the ecosystem as they help in recycling nutrients to be reused by plants. Abiotic Components Abiotic components are the non-living component of an ecosystem. It includes air, water, soil, minerals, sunlight, temperature, nutrients, wind, altitude, turbidity, etc. Functions of Ecosystem The functions of the ecosystem are as follows: It regulates the essential ecological processes, supports life systems and renders stability. It is also responsible for the cycling of nutrients between biotic and abiotic components. It maintains a balance among the various trophic levels in the ecosystem. It cycles the minerals through the biosphere. The abiotic components help in the synthesis of organic components that involve the exchange of energy. So the functional units of an ecosystem or functional components that work together in an ecosystem are: Productivity – It refers to the rate of biomass production. Energy flow – It is the sequential process through which energy flows from one trophic level to another. The energy captured from the sun flows from producers to consumers and then to decomposers and finally back to the environment. Decomposition – It is the process of breakdown of dead organic material. The top-soil is the major site for decomposition. Nutrient cycling – In an ecosystem nutrients are consumed and recycled back in various forms for the utilisation by various organisms. Types of Ecosystem An ecosystem can be as small as an oasis in a desert, or as big as an ocean, spanning thousands of miles. There are two types of ecosystem: Terrestrial Ecosystem Aquatic Ecosystem Terrestrial Ecosystem Terrestrial ecosystems are exclusively land-based ecosystems. There are different types of terrestrial ecosystems distributed around various geological zones. They are as follows: Forest Ecosystem Grassland Ecosystem Tundra Ecosystem Desert Ecosystem Forest Ecosystem A forest ecosystem consists of several plants, particularly trees, animals and microorganisms that live in coordination with the abiotic factors of the environment. Forests help in maintaining the temperature of the earth and are the major carbon sink. Grassland Ecosystem In a grassland ecosystem, the vegetation is dominated by grasses and herbs. Temperate grasslands and tropical or savanna grasslands are examples of grassland ecosystems. Tundra Ecosystem Tundra ecosystems are devoid of trees and are found in cold climates or where rainfall is scarce. These are covered with snow for most of the year. Tundra type of ecosystem is found in the Arctic or mountain tops. Desert Ecosystem Deserts are found throughout the world. These are regions with little rainfall and scarce vegetation. The days are hot, and the nights are cold. Aquatic Ecosystem Aquatic ecosystems are ecosystems present in a body of water. These can be further divided into two types, namely: Freshwater Ecosystem Marine Ecosystem Freshwater Ecosystem The freshwater ecosystem is an aquatic ecosystem that includes lakes, ponds, rivers, streams and wetlands. These have no salt content in contrast with the marine ecosystem. Marine Ecosystem The marine ecosystem includes seas and oceans. These have a more substantial salt content and greater biodiversity in comparison to the freshwater ecosystem. Also check: Habitat Diversity Important Ecological Concepts The sun is the ultimate source of energy on earth. It provides the energy required for all plant life. The plants utilise this energy for the process of photosynthesis, which is used to synthesise their food. During this biological process, light energy is converted into chemical energy and is passed on through successive trophic levels. The flow of energy from a producer, to a consumer and eventually, to an apex predator or a detritivore is called the food chain. Dead and decaying matter, along with organic debris, is broken down into its constituents by scavengers. The reducers then absorb these constituents. After gaining the energy, the reducers liberate molecules to the environment, which can be utilised again by the producers. 2. Ecological Pyramids An ecological pyramid is the graphical representation of the number, energy, and biomass of the successive trophic levels of an ecosystem. Charles Elton was the first ecologist to describe the ecological pyramid and its principals in 1927. The biomass, number, and energy of organisms ranging from the producer level to the consumer level are represented in the form of a pyramid; hence, it is known as the ecological pyramid. The base of the ecological pyramid comprises the producers, followed by primary and secondary consumers. The tertiary consumers hold the apex. In some food chains, the quaternary consumers are at the very apex of the food chain. The producers generally outnumber the primary consumers and similarly, the primary consumers outnumber the secondary consumers. And lastly, apex predators also follow the same trend as the other consumers; wherein, their numbers are considerably lower than the secondary consumers. For example, Grasshoppers feed on crops such as cotton and wheat, which are plentiful. These grasshoppers are then preyed upon by common mouse, which are comparatively less in number. The mice are preyed upon by snakes such as cobras. Snakes are ultimately preyed on by apex predators such as the brown snake eagle. In essence: Grasshopper →Mouse→ Cobra → Brown Snake Eagle 3. Food Web Food web is a network of interconnected food chains. It comprises all the food chains within a single ecosystem. It helps in understanding that plants lay the foundation of all the food chains. In a marine environment, phytoplankton forms the primary producer. Main article: Food web To learn more about what is an ecosystem, its structure, types, components, and functions, register at BYJU’S website or download the BYJU’S app. The ecosystem is the community of living organisms in conjunction with non-living components of their environment, interacting as a system. The different types of the ecosystem include: Terrestrial ecosystem Forest ecosystem Grassland ecosystem Desert ecosystem Tundra ecosystem Aquatic ecosystem Freshwater ecosystem Marine ecosystem The four main components of an ecosystem are: (i) Productivity (ii) Decomposition (iii) Energy flow (iv) Nutrient cycling We live in a terrestrial ecosystem. This is the ecosystem where organisms interact on landforms. Examples of terrestrial ecosystems include tundra, taigas, and tropical rainforests. Deserts, grasslands and temperate deciduous forests also constitute terrestrial ecosystems. The structure of the ecosystem includes the organisms and physical features of the environment, including the amount and distribution of nutrients in a particular habitat. It also provides information regarding the climatic conditions of that area. The largest ecosystem in the world is the aquatic ecosystem. It comprises freshwater and marine ecosystems. It constitutes 70% of the surface of the earth. The ecosystem is the functional unit of the environment system. The abiotic components provide the matrix for the synthesis of organic components. This process involves the exchange of energy. A good ecosystem consists of native plants and animal species interacting with each other and the environment. A healthy ecosystem has an energy source and the decomposers that break down dead plants and animal matter, returning essential nutrients to the soil. The non-living things in an ecosystem include air, wind, water, rocks, soil, temperature and sunlight. These are known as the abiotic factors of an ecosystem. Register at BYJU’S for ecosystem notes or other important study resources. Further Reading: An ecosystem is made up of all of the living and nonliving things in an area. This includes all of the plants, animals, and other living things that make up the communities of life in an area. An ecosystem also includes nonliving materials—for example, water, rocks, soil, and sand. A swamp, a prairie, an ocean, and a forest are examples of ecosystems.An ecosystem usually contains many different kinds of life. A grassland, for example, is an ecosystem that contains more than just grass. It includes other plants, mammals, insects, earthworms, and many tiny living things in the soil. Organisms within an ecosystem are classed as producers, consumers or decomposers. Energy flows through these organisms within the ecosystem.Producers, such as trees, produce food and begin this cycle. Using energy from the sun, they produce food. They do this by photosynthesis. Most producers are plants, but some small organisms produce food through photosynthesis.Producers are eaten by primary consumers, such as giraffes, who cannot produce food themselves. Primary consumers are herbivores, which means they only eat plants. Secondary consumers are carnivores such as lions. In a simple food chain, secondary consumers eat primary consumers.Decomposers break down dead plants and animals. They also break down the waste of other organisms. Examples of decomposers include bacteria and fungi. Decomposers get their energy from breaking down dead material, e.g. dead producers, dead consumers or fallen leaves. When dead material is decomposed, nutrients are released into the soil. These nutrients are then taken up from the earth by plants. Decomposers are very important for any ecosystem. If they weren’t in the ecosystem, the plants would not get essential nutrients, and dead matter and waste would gather.What is a food chain and food web?A food chain shows the relationships between feeding groups, illustrating energy flow from producer to tertiary consumer. The image below illustrates this.A food chainA food web shows lots of food chains and how they overlap.A food webWhat is the nutrient cycle? The transfer of nutrients through the ecosystem is known as the nutrient cycle.The Nutrient CycleThe nutrient cycle shows pathways through which nutrients flow. All plants and animals depend on nutrients in food for their survival. An ecosystem or biome describes a single environment and every living (biotic) organism and non-living (abiotic) factor that is contained within it or characterizes it. An ecosystem embodies every aspect of a single habitat, including all interactions between its different elements. The contents of an ecosystem can range from light and moisture levels to plant and animal life. The processes of a biome range from birth and reproduction to death and composition. In an ecosystem, living organisms are grouped into producers, consumers, and decomposers, the former representing all plant life, consumers the organisms that eat them and each other, and the latter those scavengers and bacteria that break down dead organic matter. Together, these living components are known as biotic factors. Abiotic factors, or the non-living components of an ecosystem, can be climatic, social and edaphic (influenced by the soil or ground type). The calorific flow or energy flow that travels through an ecosystem’s food chain is initially provided through the input of the ecosystem itself – for example, the amount of sunlight available for plant life, and the nutrient levels of the soil. Without abiotic factors, no ecosystem can provide for biotic factors. Ecosystems are constantly changing. Human threats to biodiversity include deforestation, pollution, transmission of disease across natural borders, introduction of non-indigenous species, and reduced natural habitats through overpopulation. More natural threats include the migration of a species into a particular region, a change in season, or a fatal disease which affects only one species. Ecosystem examples are limitless. An ecosystem does not have to cover a large region. They exist in small ponds, inside human homes, and even in the human gut. Alternatively, ecosystems can cover huge areas of the planet. One of the smallest ecosystems (in area, not in population) is that of the human gut. This ecosystem does not receive energy from sunlight, yet supports millions of living organisms. These are supplied with a food source in a moist, dark and warm environment – perfect conditions for these microorganisms. Our bodies contain thousands of ecosystems, all of them supporting huge colonies of healthy, but also pathogenic, single-celled organisms. A small, shaded pond in a temperate region represents an aquatic ecosystem. Water-logged soil and excess shade affect plant life biodiversity, where only species suited to this environment will proliferate. The availability of producers affects which organisms thrive in and around the pond. Primary consumers (herbivores) must provide enough energy for secondary consumers, and so on. Should pesticides be added to the pond, or should the pond freeze over or become choked with thick layers of weed, the ecosystem of this pond must adjust. On a much larger scale, but an artificial one, the Eden biome – a smaller representation of the global ecosystem – contains multiple ecosystems for research purposes, where separate domes have varying climates and light levels, and support different producers, consumers and decomposers. In an artificial biome many variables are tightly controlled. One does not usually place a herd of elephants in an artificial biome. Part of the Eden Project biome in Cornwall, England Ecosystem types abound; however, the most basic categorization involves three habitats: terrestrial, marine, and aquatic. Naturally, these groups can be split into thousands of smaller systems, each one offering a different mix of climate, habitat and life forms. At approximately 57 268 900 square miles, the terrestrial ecosystem covers just 29% of the globe. As these habitats are varied, terrestrial ecosystems are further broken down into six types. The deciduous forest ecosystem is found in temperate regions and experiences temperature and precipitation fluctuations according to four seasons. Current conservation goals include reintroducing apex predators after the culling practices of previous centuries, and providing an environment full with mature trees to make up for unregulated deforestation. Desert ecosystems can be hot and dry, semi-arid, coastal or cold. The feature that links these is a lack of water and the absence of a soil layer in which larger vegetation such as shrubs and trees can thrive. While indigenous life has adapted to the absence of water, a desert is still unable to support the populations of a wetter habitat. Substantially sized herbivores are unable to survive in a desert environment in large numbers, and this in turn limits the numbers of larger omnivores and carnivores. Satellite image of a desert in Oman Grasslands are also known as prairies, pampas, savanna or steppe. They can be tropical or temperate, and are a link between desert and forest. They rarely receive enough rain to support trees, but possess enough soil nutrients to feed large, grassy expanses. This provides considerable energy for primary consumers. With a large population of producers, a grassland ecosystem can similarly support large herds of herbivores, which in turn feed consumers higher up in the food chain hierarchy. The taiga is a region of subarctic forest south of the Arctic Circle. It has layers of permafrost or rock under shallow soil, which make the soil marshy. The taiga supports huge numbers of conifers – slow growing, cold-resistant trees. Other plant life is small and includes lichen, marshland plants and small shrubs. The map below shows how this ecosystem is distributed across the globe. Map of global Taiga ecosystems Tropical rainforests are probably the most quoted ecosystems in the field of environmental conservation. Located around the Equator, constant rainfall and warmth together with a lack of seasons provide a stable climate, yet cloud and the tree canopy make the rainforest floor a dark place. Soil is leached of nutrients through constant precipitation. Plant life has adapted and is abundant, making the tropical rainforest ecosystem the terrestrial ecosystem with the most biodiversity. Tundra, the last of the six terrestrial biomes, is the treeless environment of the Arctic Circle. Climate change is rapidly changing this ecosystem, as warmer weather brings non-indigenous predators in, where they compete for limited prey. Certain shrubs are taking root as the Artic permafrost layer melts. These compete with lichen – the primary food source of caribou. The Siberian Tundra Marine and aquatic ecosystems cover 139 668 500 square miles; 97% of this is salt water, making marine ecosystems the largest biome category. Large marine ecosystems (LMEs) are particularly difficult to observe and control, as different salt water habitats have complex chemical compositions that vary from coast to coast and from shallow to deep. These compositions are forever shifting due to tides and currents. Pollutants and organisms travel on courses which, although predictable, are continuously in motion. The sheer volume of water a large marine ecosystem covers is immense. The map below shows the population trends of native and invasive species of jellyfish and their populations. This study looks at the trends of jellyfish behavior in an LME. To predict this trend on a global scale is possible, but the potential and actual variables are countless. Global jellyfish populations and interactions Marine or ocean ecosystems are grouped into open marine, ocean floor, coral reef, estuary, saltwater wetland estuary, and mangrove systems. These cover marine environments from the surfaces and floors of the deepest oceans to partially terrestrial, tidal swamps. Freshwater ecosystems cover approximately 3% of the planet’s surface. Aquatic ecosystems also include estuaries before freshwater meets salt, wetlands, ponds (natural or artificial), lakes, and rivers. As fresh water is essential for all life, aquatic biomes are extremely important. Yet they are very small in comparison to other habitats, and have been used as dumping grounds for centuries. National Geographic reports that freshwater species are four to six times more at risk of becoming extinct than terrestrial or marine species. Freshwater biomes and coastal marine systems are also at high risk of eutrophication, a natural process which requires centuries to develop. Eutrophication is caused by increased levels of sediments which in turn increase levels of nutrients and encourage excessive plant growth. When vegetation dies off, after depleting the additional nutrients or becoming victims of their own success, their decomposition leads to dead zones, or hypoxic zones. Any anatomical system contains microbiota – mutualistic, commensalistic, pathogenic or parasitic bacteria, fungi, archaea and viruses. Health publications now report a relationship between gut biodiversity and the health of other anatomical and physiological systems, such as mood, hormonal production and resistance. This may be likened to the effect of reducing biodiversity in aquatic ecosystems, and the effect this will have on populations at distant locations. For example, research is looking into the prevalence of chronic inflammatory diseases as microbial diversity in the intestine decreases. The microbiome may not be an ecological ecosystem, but it is a complete ecosystem of living and non-living components in a habitat where interactions take place, and which has its own climate. , the free encyclopedia that anyone can edit. 110,331 active editors 7,022,970 articles in English School in Sketty, Swansea, photographed in 1854 The period between 1701 and 1870 saw an expansion in access to formal education in Wales, though schooling was not yet universal. Several philanthropic efforts were made to provide education to the poor during the 18th century. In the early to mid-19th century, charitable schools were established to provide a basic education. Private schools aimed at the working classes also existed. State funding was introduced to schools from 1833. Some use of the Welsh language was made in 18th-century philanthropic education, at a time when most agricultural workers in Wales spoke only Welsh, and public opinion was keen for children to learn English. Many schools punished children for speaking Welsh, despite government studies that found such methods ineffective. The government did little to promote bilingual education. Grammar schools experienced difficulties and, by the end of the period, secondary education was limited. Dissenter academies and theological colleges offered higher education. (Full article...) Recently featured: White dwarf Battle of Groix Scott Carpenter Archive By email More featured articles About Sae Kitamura ... that Sae Kitamura (pictured) has had her university students contribute to the Japanese Wikipedia as part of their coursework? ... that the lead actress of The Grub-Stake brought her personal menagerie—which included bears and wolves—to the set for use as extras? ... that James Patrick Shea thought that an invitation to meet with Pope Benedict XVI at the White House was a hoax? ... that Robby Krieger was unable to record his guitar solo for "You're Lost Little Girl" until he got stoned on hashish? ... that all three podium finishers at the 2024 Tour de France were members of cycling's Big Four? ... that the directors of Final Destination Bloodlines "debated the ethics" of a character being killed by an MRI machine? ... that one newspaper described the mansions of Riverside Drive as "glitter[ing] like a wedding cake"? ... that Galidor has been described as Lego's biggest failure? ... that the first review of Ellen, Countess of Castle Howel complained that its marriage plot focused too much on love? Archive Start a new article Nominate an article Vera Rubin Observatory The Vera C. Rubin Observatory (pictured) in Chile releases the first light images from its new 8.4-meter (28 ft) telescope. In basketball, the Oklahoma City Thunder defeat the Indiana Pacers to win the NBA Finals. An attack on a Greek Orthodox church in Damascus, Syria, kills at least 25 people. The United States conducts military strikes on three nuclear facilities in Iran. In rugby union, the Crusaders defeat the Chiefs to win the Super Rugby Pacific final. Ongoing: Gaza war Iran–Israel war Russian invasion of Ukraine timeline Sudanese civil war timeline Recent deaths: Lucien Nedzi Anne Burrell Frederick W. Smith Ron Taylor Mohammad Kazemi Marita Camacho Quirós Nominate an article June 25 Original rainbow flag 1658 – Anglo-Spanish War: The largest battle ever fought on Jamaica, the three-day Battle of Rio Nuevo, began. 1910 – The United States Congress passed the Mann Act, which prohibited the interstate transport of females for "immoral purposes". 1944 – World War II: U.S. Navy and Royal Navy ships bombarded Cherbourg, France, to support U.S. Army units engaged in the Battle of Cherbourg. 1978 – The rainbow flag (original version pictured) representing gay pride was first flown at the San Francisco Gay Freedom Day parade. 2009 – Singer Michael Jackson died as a result of the combination of drugs in his body. Giovanni Battista Riccioli (d. 1671)Eloísa Díaz (b. 1866)George Michael (b. 1963)Farrah Fawcett (d. 2009) More anniversaries: June 24 June 25 June 26 Archive By email List of days of the year About 1795 Turban Head eagle with original reverse 1797 Turban Head eagle with heraldic eagle reverse The Turban Head eagle was a ten-dollar gold piece, or eagle, struck by the United States Mint from 1795 to 1804. The piece was designed by Robert Scot, and was the first in the eagle series, which continued until the Mint ceased striking gold coins for circulation in 1933. The common name is a misnomer; Liberty does not wear a turban but a cap, believed by some to be a pileus or Liberty cap: her hair twisting around the headgear makes it appear to be a turban. The number of stars on the obverse was initially intended to be equal to the number of states in the Union, but with the number at 16, that idea was abandoned in favor of using 13 stars in honor of the original states. The initial reverse, featuring an eagle with a wreath in its mouth, proved unpopular and was replaced by a heraldic eagle. Increases in the price of gold made it profitable for the coins to be melted down, and in 1804, President Thomas Jefferson ended coinage of eagles; the denomination was not struck again for circulation for more than 30 years. These Turban Head eagles are in the National Numismatic Collection at the National Museum of American History. Coin design credit: United States Mint; photographed by Jaclyn Nash Recently featured: Springbok Geraldine Ulmar Shah Mosque (Isfahan) Archive More featured pictures Community portal – The central hub for editors, with resources, links, tasks, and announcements. Village pump – Forum for discussions about Wikipedia itself, including policies and technical issues. Site news – Sources of news about Wikipedia and the broader Wikimedia movement. Teahouse – Ask basic questions about using or editing Wikipedia. Help desk – Ask questions about using or editing Wikipedia. Reference desk – Ask research questions about encyclopedic topics. Content portals – A unique way to navigate the encyclopedia. Wikipedia is written by volunteer editors and hosted by the Wikimedia Foundation, a non-profit organization that also hosts a range of other volunteer projects: CommonsFree media repository MediaWikiWiki software development Meta-WikiWikimedia project coordination WikibooksFree textbooks and manuals WikidataFree knowledge base WikinewsFree-content news WikiquoteCollection of quotations WikisourceFree-content library WikispeciesDirectory of species WikiversityFree learning tools WikivoyageFree travel guide WiktionaryDictionary and thesaurus This Wikipedia is written in English. Many other Wikipedias are available; some of the largest are listed below. 1,000,000+ articles العربية Deutsch Español فارسی Français Italiano Nederlands 日本語 Polski Português Русский Svenska Українська Tiếng Việt 中文 250,000+ articles Bahasa Indonesia Bahasa Melayu Bân-lâm-gú Български Català Čeština Dansk Eesti Ελληνικά Esperanto Euskara עברית Հայերեն Magyar Norsk bokmål Română Simple English Slovenčina Srpski Srpskohrvatski Suomi Türkçe Oʻzbekcha 50,000+ articles Asturianu Azərbaycanca □□□□□ Bosanski کوردی Frysk Gaeilge Galego Hrvatski ქართული Kurdî Latviešu Lietuvių □□□□□□ Македонски □□□□□□□□□□□ Norsk nynorsk □□□□□□ Shqip Slovenščina □□□ □□□□□□ اردو Retrieved " 2 This article needs additional citations for verification. Please help improve this article by adding citations to reliable sources. Unsourced material may be challenged and removed.Find sources: "1658" – news · newspapers · books · scholar · JSTOR (January 2016) (Learn how and when to remove this message) Calendar year Years Millennium 2nd millennium Centuries 16th century 17th century 18th century Decades 1630s 1640s 1650s 1660s 1670s Years 1655 1656 1657 1658 1659 1660 1661 vte January 30: Swedish troops cross the frozen waters of the Danish straits on foot in the March Across the Belts 1658 by topic Arts and science Architecture Art Literature Music Science Leaders State leaders Colonial governors Religious leaders Birth and death categories Births – Deaths Establishments and disestablishments categories Establishments – Disestablishments Works category Works vte 1658 in various calendarsGregorian calendar1658MDCLVIIIAb urbe condita2411Armenian calendar1107ԹՎ ՌՃԷAssyrian calendar6408Balinese saka calendar1579–1580Bengali calendar1064–1065Berber calendar2608English Regnal year9 Cha. 2 – 10 Cha. 2(Interregnum)Buddhist calendar2202Burmese calendar1020Byzantine calendar7166–7167Chinese calendar丁酉年 (Fire Rooster)4355 or 4148 — to —戊戌年 (Earth Dog)4356 or 4149Coptic calendar1374–1375Discordian calendar2824Ethiopian calendar1650–1651Hebrew calendar5418–5419Hindu calendars - Vikram Samvat1714–1715 - Shaka Samvat1579–1580 - Kali Yuga4758–4759Holocene calendar11658Igbo calendar658–659Iranian calendar1036–1037Islamic calendar1068–1069Japanese calendarMeireki 4 / Manji 1(万治元年)Javanese calendar1580–1581Julian calendarGregorian minus 10 daysKorean calendar3991Minguo calendar254 before ROC民前254年Nanakshahi calendar190Thai solar calendar2200–2201Tibetan calendar阴火鸡年(female Fire-Rooster)1784 or 1403 or 631 — to —阳土狗年(male Earth-Dog)1785 or 1404 or 632 June 14: Battle of the Dunes 1658 (MDCLVIII) was a common year starting on Tuesday of the Gregorian calendar and a common year starting on Friday of the Julian calendar, the 1658th year of the Common Era (CE) and Anno Domini (AD) designations, the 658th year of the 2nd millennium, the 58th year of the 17th century, and the 9th year of the 1650s decade. As of the start of 1658, the Gregorian calendar was 10 days ahead of the Julian calendar, which remained in localized use until 1923. Calendar year January 13 – Edward Sexby, who had plotted against Oliver Cromwell, dies in the Tower of London.[1] January 30 – The "March Across the Belts" (Tåget över Bält), Sweden's use of winter weather to send troops across the waters of the Danish straits at a time when winter has turned them to ice, begins. Within 17 days, Sweden's King Karl X Gustav leads troops across the ice belts to capture six of Denmark's islands as Swedish territory. February 5 – Prince Muhi al-Din Muhammad, one of the sons of India's Mughal, Emperor Shah Jahan, proclaims himself Emperor after Jahan names Muhi's older brother, Dara Shikoh, as regent, and departs from Aurangabad with troops. February 6 – Swedish troops of Charles X Gustav of Sweden cross The Great Belt in Denmark, over frozen sea.[2] March 8 (February 26 OS) – The peace between Sweden and Denmark-Norway is concluded in Roskilde by the Treaty of Roskilde, under which Denmark is forced to cede significant territory. This leads to Sweden reaching its territorial height during its time as a great power. April 15 – In India, the Battle of Dharmat is fought in the modern-day state of Madhya Pradesh between rival claimants to the throne of the Mughal Empire. Prince Muhi al-Din Muhammad, the son of the Emperor Shah Jahan, leads 30,000 men in a triumph over 22,000 troops led by Jaswant Singh of Marwar and Ratan Singh Rathore. Despite heavy losses, with more than 11,000 casualties, Prince Muhi, who has adopted the name Aurangzeb, continues toward Samugarh and Agra and captures the throne at the end of July. April 16 – In Skåneland, a region recently ceded by Denmark to the Swedish Empire, representatives of the nobility of the provinces of Blekinge, Halland and Scania gather at the Scanian city of Malmö to swear their allegiance to King Charles X Gustav of Sweden. May 1 – Hydriotaphia, Urn Burial and The Garden of Cyrus are published by Thomas Browne in England. May 29 – Aurangzeb wins the Battle of Samugarh as Indian Mughal regent Dara Shikoh makes a last effort to defend the Mughal capital Agra. June 3 – Pope Alexander VII appoints François de Laval vicar apostolic of New France. June 14 – Anglo-Spanish War (1654–60) and Franco-Spanish War (1635–59): In the Battle of the Dunes, a Spanish force attempting to lift a siege of Dunkirk is defeated by the French and English. England is then given Dunkirk, for its assistance in the victory. June 25–27 – In the Battle of Rio Nuevo, part of the Anglo-Spanish War, a Spanish invasion force fails to recapture Jamaica from the English. July 2 – The Siege of Toruń begins in Poland as troops of the Polish–Lithuanian Commonwealth and of Austria seek to recapture the city of Toruń from a garrison of the Swedish Army. Within six months, the Swedish occupiers surrender. July 18 – Prince Leopold of the House of Habsburg, son of the late Ferdinand III, is elected as the new Holy Roman Emperor. July 31 – After Shah Jahan completes the Taj Mahal, his son Aurangzeb deposes him as ruler of the Mughal Empire. July – Šarhūda's Manchu fleet annihilates Onufriy Stepanov's Russian flotilla, on the Amur River. August 1 – The coronation of Leopold I takes place in Frankfurt. August 5 – Just six months after winning territory from Denmark-Norway in war and subsequent treaty, Sweden's King Charles X Gustav declares a second war against Denmark. By August 11, the King's troops have surrounded Denmark's capital, Copenhagen, while the Swedish Navy blocks the harbor to prevent the city from being resupplied, and begins bombardment. August 14 – The League of the Rhine (Rheinische Allianz) is formed by 50 German princes whose cities are on the Rhine river. September 3 – Oliver Cromwell dies and his son Richard assumes his father's position as Lord Protector of England, Scotland and Ireland. September 17 – Portuguese Restoration War: In the Battle of Vilanova, a Spanish army, having crossed the Minho, defeats the Portuguese. October 7 – The Netherlands enters the Dano-Swedish War to come to the rescue of Denmark, sending a 45-ship fleet from Vlie. October 29 – The 45-ship fleet of the Netherlands arrives at Denmark and begins its counterattack on Sweden's army and navy with three squadrons. November 6 – The Mexican Inquisition carries out the execution, by public burning, of 14 men convicted of homosexuality, while another 109 arrested are either released or given less harsh sentences. November 8 (October 29 old style) – The Battle of the Sound takes place between the navies of the Dutch Republic (with 41 warships) and of Sweden (with 45) at the Øresund, a strait between Denmark and Sweden's newly-acquired territory, the former Danish island of Scania. The Dutch Republic is successful at breaking the Swedish Navy's blockade of Copenhagen, and Sweden is forced to retreat, bringing an end to the attempted conquest of Denmark. November 23 – The elaborate funeral of Lord Protector of England Oliver Cromwell (who had died on September 3 and was buried at Westminster Abbey two weeks later) is carried out in London. A little more than two years later (in January 1661), his body will be disinterred and his head severed and placed on a spike. December 11 – Abaza Hasan Pasha, an Ottoman provincial governor who is attempting to depose the Grand Vizier, wins a battle at the Turkish city of Ilgin, defeating loyalist forces led by Murtaza Pasha. The victory is the last for the rebels. Two months later (February 16, 1659) Abaza Hasan is assassinated after being invited to peace negotiations by the loyalists. December 20 – Representatives of the Russian Empire and the Swedish Empire sign the Treaty of Valiesar at the Valiesar Estate near Narva, part of modern-day Estonia. In return for ceasing hostilities between the two empires in the Second Northern War, Russia is allowed to keep captured territories in Livonia (part of modern-day Latvia) for a term of three years. December 25 – Polish and Danish forces defeat a Swedish Army in the Battle of Kolding in Denmark. December 30 – The Siege of Toruń ends almost six months after it started, with Poland recapturing the city from Sweden. Portuguese traders are expelled from Ceylon by Dutch invaders. The Dutch in the Cape Colony start to import slaves from India and South-East Asia (later from Madagascar). Mary of Modena January 9 – Nicolas Coustou, French artist (d. 1733)[3] January 17 – Samson Wertheimer, European rabbi (d. 1724) January 17 – Francis Seymour, 5th Duke of Somerset (d. 1678) February 18 – Charles-Irénée Castel de Saint-Pierre, French writer (d. 1743) March 5 – Antoine de la Mothe Cadillac, French explorer (d. 1730) March 8 – Thomas Trevor, 1st Baron Trevor, British Baron (d. 1730) March 23 – Jean-Baptiste Santerre, French painter (d. 1717) March 30 – Muro Kyūsō, Japanese Neo-Confucian scholar (d. 1734) April 11 – James Hamilton, 4th Duke of Hamilton, Scottish peer (d. 1712) April 19 – Johann Wilhelm, Elector Palatine, German noble (d. 1716) April 22 – Giuseppe Torelli, Italian violist, violinist, pedagogue and composer (d. 1709) May 30 – Sir Henry Furnese, 1st Baronet, English merchant and politician (d. 1712) June 10 – John March, Massachusetts businessman, colonel (d. 1712) June 11 – Victor Honoré Janssens, Flemish painter (d. 1736) June 22 – Louis VII, Landgrave of Hesse-Darmstadt (d. 1678) July 10 – Luigi Ferdinando Marsili, Italian soldier and naturalist (d. 1730) July 14 – Camillo Rusconi, Italian artist (d. 1728) July 17 – Diogo de Mendonça Corte-Real, Portuguese politician (d. 1736) July 21 – Alexis Littré, French physician and anatomist (d. 1726) July 25 – Archibald Campbell, 1st Duke of Argyll, Scottish privy councillor (d. 1703) July 28 – Roelof Diodati, Dutch Governor of Mauritius (d. 1723) August 1 – Pierre Joseph Garidel, French botanist (d. 1737) August 5 – Claude Audran III, French painter (d. 1734) August 10 – Susanne Maria von Sandrart, German engraver (d. 1716) August 11 – Sir Justinian Isham, 4th Baronet, English baronet and Member of Parliament (d. 1730) August 16 – Jan Frans van Son, Flemish Baroque painter (d. 1704) August 16 – Ralph Thoresby, British historian (d. 1725) August 18 – Jan František Beckovský, Czech historian (d. 1722) August 22 – John Ernest IV, Duke of Saxe-Coburg-Saalfeld (d. 1729) August 28 – Honoré Tournély, French theologian (d. 1729) September 1 – Jacques Bernard, French theologian and publicist (d. 1718) September 16 – John Dennis, English dramatist and critic (d. 1734) September 24 – Sir Robert Anstruther, 1st Baronet, Scottish politician (d. 1737) September 30 – Elisabeth Eleonore of Brunswick-Wolfenbüttel, Duchess consort of Saxe-Meiningen (d. 1729) October 2 – Nicholas Roosevelt (1658–1742), Dutch-American politician (d. 1742) October 5 – Mary of Modena, queen of James II of England (d. 1718) October 11 – Christian Heinrich Postel, German jurist (d. 1705) October 18 – Alexander of Courland, German prince (d. 1686) October 19 – Adolphus Frederick II, Duke of Mecklenburg-Strelitz (d. 1704) October 21 – Henri de Boulainvilliers, French nobleman (d. 1722) October 24 – Marko Gerbec, Carniolan physician, scientist (d. 1718) November 2 – Baptist Noel (MP), English politician (d. 1690) November 4 – Sulkhan-Saba Orbeliani, Georgian prince, writer, monk and author (d. 1725) November 21 – Johann Gottfried Roesner, Prussian burgomaster (d. 1724) November 27 – Tsarevna Catherine Alekseyevna of Russia, daughter of Tsar Alexis of Russia (d. 1718) November 27 – Hercule-Louis Turinetti, marquis of Prié (d. 1726) December 2 – Sir Thomas Roberts, 4th Baronet, English politician (d. 1706) December 10 – Lancelot Blackburne, Archbishop of York (d. 1743) date unknown – Elizabeth Barry, English actress (d. 1713) John Cleveland Witte Corneliszoon de With January 1 – Caspar Sibelius, Dutch Protestant minister (b. 1590) January 2 – Sir William Armine, 2nd Baronet, English politician (b. 1622) January 7 – Theophilus Eaton, English-born Connecticut colonist (b. 1590) January 13 – Edward Sexby, English Puritan soldier (b. 1616) February 19 – Henry Wilmot, 1st Earl of Rochester (b. 1612) March 25 – Herman IV, Landgrave of Hesse-Rotenburg (b. 1607) February 27 – Adolf Frederick I, Duke of Mecklenburg-Schwerin (1592–1628 and again 1631–1658) (b. 1588) March 29 – Bertuccio Valiero, Doge of Venice (b. 1596) April 7 – Juan Eusebio Nieremberg, Spanish mystic (b. 1595) April 19 Kirsten Munk, second wife of Christian IV of Denmark (b. 1598) Robert Rich, 2nd Earl of Warwick, English colonial administrator and admiral (b. 1587) April 24 – Francesco Maria Richini, Italian architect (b. 1584) April 29 – John Cleveland, English poet (b. 1613) May 20 – Bartholomew Holzhauser, German priest, visionary and writer of prophecies (b. 1613) June 18 – Louis Cappel, French Protestant churchman and scholar (b. 1585) June 8 – Sir Henry Slingsby, 1st Baronet, English baronet (b. 1602) June 27 – Ercole Gennari, Italian drawer and painter (b. 1597) July 22 – Frederick, Duke of Schleswig-Holstein-Sønderburg-Norburg (b. 1581) August 5 – Gundakar, Prince of Liechtenstein, court official in Vienna (b. 1580) August 6 – Elizabeth Claypole, daughter of Oliver Cromwell (b. 1629) August 19 – Christine of Hesse-Kassel, Duchess of Saxe-Eisenach and Saxe-Coburg (b. 1578) September 3 – Oliver Cromwell, Lord Protector of England, Scotland, and Ireland (b. 1599) September 17 – Kaspar von Barth, German philologist and writer (b. 1587) September 22 – Georg Philipp Harsdörffer, German poet (b. 1607) October 14 – Francesco I d'Este, Duke of Modena, Italian noble (b. 1610) October 23 – Thomas Pride, Parliamentarian general in the English Civil War November 4 – Antoine Le Maistre, French Jansenist (b. 1608) November 6 – Pierre du Ryer, French dramatist (b. 1606) November 7 – Maeda Toshitsune, Japanese warlord (b. 1594) November 8 – Witte de With, Dutch naval officer (b. 1599) November 26 – Duke Francis Henry of Saxe-Lauenburg (b. 1604) November 29 – Margrave Charles Magnus of Baden-Durlach (b. 1621) December 6 – Baltasar Gracián y Morales, Spanish writer (b. 1601) December 15 – Carlo Emanuele Madruzzo, Italian prince-bishop (b. 1599) December 20 – Jean Jannon, French typefounder (b. 1580) Date unknown:

Osoet Pegua, Thai businesswoman (b. 1615) ^ "killing". Oxford Reference. Retrieved December 14, 2021. ^ Brems, Hans (June 1970). "Sweden: From Great Power to Welfare State". Journal of Economic Issues. 4 (2, 3). Association for Evolutionary Economics: 1–16. doi:10.1080/00213624.1970.11502941. JSTOR 4224039. A swift and brilliantly conceived march from Holstein across the frozen Danish waters on Copenhagen, by Karl X Gustav in 1658, finally wrests Bohuslin, Sk'ane, and Blekinge from Denmark-Norway. Denmark no longer controls both sides of Oresund, and Swedish power is at its peak. ^ "Nicolas Coustou | French sculptor | Britannica". www.britannica.com. Retrieved December 14, 2021. Retrieved from " 3One hundred years, from 1501 to 1600 This article needs additional citations for verification. Please help improve this article by adding citations to reliable sources. Unsourced material may be challenged and removed.Find sources: "16th century" – news · newspapers · books · scholar · JSTOR (September 2022) (Learn how and when to remove this message) Millennia 2nd millennium Centuries 15th century 16th century 17th century Timelines 15th century 16th century 17th century State leaders 15th century 16th century 17th century Decades 1500s 1510s 1520s 1530s 1540s 1550s 1560s 1570s 1580s 1590s Categories: Births – Deaths Establishments – Disestablishments vte The world map by the Italian Amerigo Vespucci (from whose name the word America is derived) and Belgian Gerardus Mercator shows (besides the classical continents Europe, Africa, and Asia) the Americas as America sive India Nova', New Guinea, and other islands of Southeast Asia, as well as a hypothetical Arctic continent and a yet undetermined Terra Australis.[1]The 16th century began with the Julian year 1501 (represented by the Roman numerals MDI) and ended with either the Julian or the Gregorian year 1600 (MDC), depending on the reckoning used (the Gregorian calendar introduced a lapse of 10 days in October 1582).[1] The Renaissance in Italy and Europe saw the emergence of important artists, authors and scientists, and led to the foundation of important subjects which include accounting and political science. Copernicus proposed the heliocentric universe, which was met with strong resistance, and Tycho Brahe refuted the theory of celestial spheres through observational measurement of the 1572 appearance of a Milky Way supernova. These events directly challenged the long-held notion of an immutable universe supported by Ptolemy and Aristotle, and led to major revolutions in astronomy and science. Galileo Galilei became a champion of the new sciences, invented the first thermometer and made substantial contributions in the fields of physics and astronomy, becoming a major figure in the Scientific Revolution in Europe. Spain and Portugal colonized large parts of Central and South America, followed by France and England in Northern America and the Lesser Antilles. The Portuguese became the masters of trade between Brazil, the coasts of Africa, and their possessions in the Indies, whereas the Spanish came to dominate the Greater Antilles, Mexico, Peru, and opened trade across the Pacific Ocean, linking the Americas with the Indies. English and French privateers began to practice persistent theft of Spanish and Portuguese treasures. This era of colonialism established mercantilism as the leading school of economic thought, where the economic system was viewed as a zero-sum game in which any gain by one party required a loss by another. The mercantilist doctrine encouraged the many intra-European wars of the period and arguably fueled European expansion and imperialism throughout the world until the 19th century or early 20th century. The Reformation in central and northern Europe gave a major blow to the authority of the papacy and the Catholic Church. In England, the British-Italian Alberico Gentili wrote the first book on public international law and divided secularism from canon law and Catholic theology. European politics became dominated by religious conflicts, with the groundwork for the epochal Thirty Years' War being laid towards the end of the century. In the Middle East, the Ottoman Empire continued to expand, with the sultan taking the title of caliph, while dealing with a resurgent Persia. Iran and Iraq were caught by a major popularity of the Shia sect of Islam under the rule of the Safavid dynasty of warrior-mystics, providing grounds for a Persia independent of the majority-Sunni Muslim world.[2] In the Indian subcontinent, following the defeat of the Delhi Sultanate and Vijayanagara Empire, new powers emerged, the Sur Empire founded by Sher Shah Suri, Deccan sultanates, Rajput states, and the Mughal Empire[3] by Emperor Babur, a direct descendant of Timur and Genghis Khan.[4] His successors Humayun and Akbar, enlarged the empire to include most of South Asia. Japan suffered a severe civil war at this time, known as the Sengoku period, and emerged from it as a unified nation under Toyotomi Hideyoshi. China was ruled by the Ming dynasty, which was becoming increasingly isolationist, coming into conflict with Japan over the control of Korea as well as Japanese pirates. In Africa, Christianity had begun to spread in Central Africa and Southern Africa. Until the Scramble for Africa in the late 19th century, most of Africa was left uncolonized. For timelines of earlier events, see 15th century and Timeline of the Middle Ages. Main article: 1500s Mona Lisa, by Leonardo da Vinci, c. 1503–1506, one of the world's best-known paintings 1501: Michelangelo returns to his native Florence to begin work on the statue David. 1501: Safavid dynasty reunifies Iran and rules over it until 1736. Safavids adopt a Shia branch of Islam.[5] 1501: First Battle of Cannanore between the Third Portuguese Armada and Kingdom of Cochin under João da Nova and Zamorin of Kozhikode's navy marks the beginning of Portuguese conflicts in the Indian Ocean. 1502: First reported African slaves in the New World 1502: The Crimean Khanate sacks Sarai in the Golden Horde, ending its existence. 1503: Spain defeats France at the Battle of Cerignola. Considered to be the first battle in history won by gunpowder small arms. 1503: Leonardo da Vinci begins painting the Mona Lisa and completes it three years later. 1503: Nostradamus is born on either December 14 or December 21. 1504: A period of drought, with famine in all of Spain. 1504: Death of Isabella I of Castile; Joanna of Castile becomes the Queen. 1504: Foundation of the Sultanate of Sennar by Amara Dunqas, in what is modern Sudan 1505: Zhengde Emperor ascends the throne of Ming dynasty. 1505: Martin Luther enters St. Augustine's Monastery at Erfurt, Germany, on 17 July and begins his journey to instigating the Reformation. 1505: Sultan Trenggono builds the first Muslim kingdom in Java, called Demak, in Indonesia. Many other small kingdoms were established in other islands to fight against Portuguese. Each kingdom introduced local language as a way of communication and unity. 1506: Leonardo da Vinci completes the Mona Lisa. 1506: King Afonso I of Kongo wins the battle of Mbanza Kongo, resulting in Catholicism becoming Kongo's state religion.Battle of Cerignola: El Gran Capitan finds the corpse of Louis d'Armagnac, Duke of Nemours 1506: At least two thousand converted Jews are massacred in a Lisbon riot, Portugal. 1506: Christopher Columbus dies in Valladolid, Spain. 1506: Poland is invaded by Tatars from the Crimean Khanate. 1507: The first recorded epidemic of smallpox in the New World on the island of Hispaniola. It devastates the native Taíno population.[6] 1507: Afonso de Albuquerque conquered Hormuz and Muscat, among other bases in the Persian Gulf, taking control of the region at the entrance of the Gulf. 1508: The Christian-Islamic power struggle in Europe and West Asia spills over into the Indian Ocean as Battle of Chaul during the Portuguese-Mamluk War 1508–1512: Michelangelo paints the Sistine Chapel ceiling. 1509: The defeat of joint fleet of the Sultan of Gujarat, the Mamlûk Burji Sultanate of Egypt, and the Zamorin of Calicut with support of the Republic of Venice and the Ottoman Empire in Battle of Diu marks the beginning of Portuguese dominance of the Spice trade and the Indian Ocean. 1509: The Portuguese king sends Diogo Lopes de Sequeira to find Malacca, the eastern terminus of Asian trade. After initially receiving Sequeira, Sultan Mahmud Shah captures and/or kills several of his men and attempts an assault on the four Portuguese ships, which escape.[7] The Javanese fleet is also destroyed in Malacca. 1509: Krishnadevaraya ascends the throne of Vijayanagara Empire. Main article: 1510s Afonso de Albuquerque 1509–1510: The 'great plague' in various parts of Tudor England.[8] 1510: Afonso de Albuquerque of Portugal conquers Goa in India. 1511: Afonso de Albuquerque of Portugal conquers Malacca, the capital of the Sultanate of Malacca in present-day Malaysia. 1512: Copernicus writes Commentariolus, and proclaims the Sun the center of the Solar System. 1512: The southern part (historical core) of the Kingdom of Navarre is invaded by Castile and Aragon. 1512: Qutb Shahi dynasty, founded by Quli Qutb Mulk, rules Golconda Sultanate until 1687. 1512: The first Portuguese exploratory expedition was sent eastward from Malacca (in present-day Malaysia) to search for the 'Spice Islands' (Maluku) led by Francisco Serrão. Serrão is shipwrecked but struggles on to Hitu (northern Ambon) and wins the favour of the local rulers.[9] 1513: Machiavelli writes The Prince, a treatise about political philosophy 1513: The Portuguese mariner Jorge Álvares lands at Macau, China, during the Ming dynasty. 1513: Henry VIII defeats the French at the Battle of the Spurs. 1513: The Battle of Flodden Field in which invading Scots are defeated by Henry VIII's forces. 1513: Sultan Selim I ("The Grim") orders the massacre of Shia Muslims in Anatolia (present-day Turkey). 1513: Vasco Núñez de Balboa, in service of Spain arrives at the Pacific Ocean (which he called Mar del Sur) across the Isthmus of Panama. He was the first European to do so. 1514: The Battle of Orsha halts Muscovy's expansion into Eastern Europe. 1514: Dózsa rebellion (peasant revolt) in Hungary.Martin Luther initiated the Reformation with his Ninety-five Theses in 1517. 1514: The Battle of Chaldiran, the Ottoman Empire gains decisive victory against Safavid dynasty. 1515: Ascension of Francis I of France as King of France following the death of Louis XII. 1515: The Ottoman Empire wrests Eastern Anatolia from the Safavids after the Battle of Chaldiran. 1515: The Ottomans conquer the last beyliks of Anatolia, the Dulkadirs and the Ramadanids. 1516–1517: The Ottomans defeat the Mamluks and gain control of Egypt, Arabia, and the Levant. 1517: The Sweating sickness epidemic in Tudor England.[10] 1517: The Reformation begins when Martin Luther posts his Ninety-five Theses in Saxony. 1518: The Treaty of London was a non-aggression pact between the major European nations. The signatories were Burgundy, France, England, the Holy Roman Empire, the Netherlands, the Papal States and Spain, all of whom agreed not to attack one another and to come to the aid of any that were under attack. 1518: Mir Chakar Khan Rind leaves Baluchistan and settles in Punjab. 1518: Leo Africanus, also known as al-Hasan ibn Muhammad al-Wazzan al-Fasi, an Andalusian Berber diplomat who is best known for his book Descrittione dell'Africa (Description of Africa), is captured by Spanish pirates; he is taken to Rome and presented to Pope Leo X. 1518: The dancing plague of 1518 begins in Strasbourg, lasting for about one month. 1519: Leonardo da Vinci dies of natural causes on May 2.Europe at the time of the accession of Charles V in 1519 1519: Wang Yangming, the Chinese philosopher and governor of Jiangxi province, describes his intent to use the firepower of the fo-lang-ji, a breech-loading Portuguese culverin, in order to suppress the rebellion of Prince Zhu Chenhao. 1519: Barbary pirates led by Hayreddin Barbarossa, a Turk appointed to ruling position in Algiers by the Ottoman Empire, raid Provence and Toulon in southern France. 1519: Death of Emperor Maximilian; Charles I of Austria, Spain, and the Low Countries becomes Emperor of Holy Roman Empire as Charles V, Holy Roman Emperor (ruled until 1556). 1519–1522: Spanish expedition commanded by Magellan and Elcano are the first to Circumnavigate the Earth. 1519–1521: Hernán Cortés leads the Spanish conquest of the Aztec Empire. Main article: 1520s Ferdinand Magellan led the first expedition that circumnavigated the globe in 1519–1522. 1520–1566: The reign of Suleiman the Magnificent marks the zenith of the Ottoman Empire. 1520: The first European diplomatic mission to Ethiopia, sent by the Portuguese, arrives at Massawa 9 April, and reaches the imperial encampment of Emperor Dawit II in Shewa 9 October. 1520: Vijayanagara Empire forces under Krishnadevaraya defeat the Adil Shahi under at the Battle of Raichur 1520: Sultan Ali Mughayat Shah of Aceh begins an expansionist campaign capturing Daya on the west Sumatran coast (in present-day Indonesia), and the pepper and gold producing lands on the east coast. 1520: The Portuguese established a trading post in the village of Lamakera on the eastern side of Solor (in present-day Indonesia) as a transit harbour between Maluku and Malacca. 1521: Belgrade (in present-day Serbia) is captured by the Ottoman Empire. 1521: After building fortifications at Tuen Mun, the Portuguese attempt to invade Ming dynasty China, but are expelled by Chinese naval forces. 1521: Philippines encountered by Ferdinand Magellan. He was later killed in the Battle of Mactan in central Philippines in the same year. 1521: Jiajing Emperor ascended the throne of Ming dynasty, China. 1521: November, Ferdinand Magellan's expedition reaches Maluku (in present-day Indonesia) and after trade with Ternate returns to Europe with a load of cloves. 1521: Pati Unus leads the invasion of Malacca (in present-day Malaysia) against the Portuguese occupation. Pati Unus was killed in this battle, and was succeeded by his brother, sultan Trenggana. 1522: Rhodes falls to the Ottomans of Suleiman the Magnificent.[11]Sack of Rome of 1527 by Charles V's forces (painting by Johannes Lingelbach) 1522: The Portuguese ally themselves with the rulers of Ternate (in present-day Indonesia) and begin construction of a fort.[9] 1522: August, Luso-Sundanese Treaty signed between Portugal and Sunda Kingdom granted Portuguese permit to build fortress in Sunda Kelapa. 1523: Sweden gains independence from the Kalmar Union. 1523: The Cacao bean is introduced to Spain by Hernán Cortés 1524–1525: German Peasants' War in the Holy Roman Empire. 1524: Giovanni da Verrazzano is the first European to explore the Atlantic coast of North America between South Carolina and Newfoundland. 1524: Ismail I, the founder of Safavid dynasty, dies and Tahmasp I becomes king.Gun-wielding Ottoman Janissaries and defending Knights of Saint John at the siege of Rhodes in 1522, from an Ottoman manuscript 1525: Timurid Empire forces under Babur defeat the Lodi dynasty at the First Battle of Panipat, end of the Delhi Sultanate. 1525: German and Spanish forces defeat France at the Battle of Pavia, Francis I of France is captured. 1526: The Ottomans defeat the Kingdom of Hungary at the Battle of Mohács. 1526: Mughal Empire, founded by Babur. 1527: Sack of Rome with Pope Clement VII escaping and the Swiss Guards defending the Vatican being killed. The sack of the city of Rome considered the end of the Italian Renaissance. 1527: Protestant Reformation begins in Sweden. 1527: The last ruler of Majapahit falls from power. This state (located in present-day Indonesia) was finally extinguished at the hands of the Demak. A large number of courtiers, artisans, priests, and members of the royalty moved east to the island of Bali; however, the power and the seat of government transferred to Demak under the leadership of Pangeran, later Sultan Fatah. 1527: June 22, The Javanese Prince Fatahillah of the Cirebon Sultanate successfully defeated the Portuguese armed forces at the site of the Sunda Kelapa Harbor. The city was then renamed Jayakarta, meaning "a glorious victory." This eventful day came to be acknowledged as Jakarta's Founding Anniversary. 1527: Mughal Empire forces defeat the Rajput led by Rana Sanga of Mewar at the Battle of Khanwa 1529: The Austrians defeat the Ottoman Empire at the siege of Vienna. 1529: Treaty of Zaragoza defined the antimeridian of Tordesillas attributing the Moluccas to Portugal and Philippines to Spain. 1529: Imam Ahmad Gurey defeats the Ethiopian Emperor Dawit II in the Battle of Shimbra Kure, the opening clash of the Ethiopian–Adal War. Main article: 1530s Spanish conquistadors with their Tlaxcallan allies fighting against the Otomies of Metztitlan in present-day Mexico, a 16th-century codex 1531–1532: The Church of England breaks away from the Catholic Church and recognizes King Henry VIII as the head of the Church. 1531: The Inca Civil War is fought between the two brothers, Atahualpa and Huáscar. 1532: Francisco Pizarro leads the Spanish conquest of the Inca Empire. 1532: Foundation of São Vicente, the first permanent Portuguese settlement in the Americas. 1533: Anne Boleyn becomes Queen of England. 1533: Elizabeth Tudor is born. 1534: Jacques Cartier claims Canada for France. 1534: The Ottomans capture Baghdad from the Safavids. 1534: Affair of the Placards, where King Francis I becomes more active in repression of French Protestants. 1535: The Münster Rebellion, an attempt of radical, millennialist, Anabaptists to establish a theocracy, ends in bloodshed. 1535: The Portuguese in Ternate depose Sultan Tabariji (or Tabarija) and send him to Portuguese Goa where he converts to Christianity and bequeaths his Portuguese godfather Jordao de Freitas the island of Ambon.[12] Hairun becomes the next sultan. 1536: Catherine of Aragon dies in Kimbolton Castle, in England.Territorial expansion of the Ottoman Empire under Suleiman (in red and orange) 1536: In England, Anne Boleyn is beheaded for adultery and treason. 1536: Establishment of the Inquisition in Portugal. 1536: Foundation of Buenos Aires (in present-day Argentina) by Pedro de Mendoza. 1537: The Portuguese establish Recife in Pernambuco, north-east of Brazil. 1537: William Tyndale's partial translation of the Bible into English is published, which would eventually be incorporated into the King James Bible. 1538: Gonzalo Jiménez de Quesada founds Bogotá. 1538: Spanish–Venetian fleet is defeated by the Ottoman Turks at the Battle of Preveza. 1539: Hernando de Soto explores inland North America. Main article: 1540s Nicolaus Copernicus 1540: The Society of Jesus, or the Jesuits, is founded by Ignatius of Loyola and six companions with the approval of Pope Paul III. 1540: Sher Shah Suri founds the Suri dynasty in South Asia, an ethnic Pashtun (Pathan) of the house of Sur, who supplanted the Mughal dynasty as rulers of North India during the reign of the relatively ineffectual second Mughal emperor Humayun. Sher Shah Suri decisively defeats Humayun in the Battle of Bilgram (May 17, 1540). 1541: Pedro de Valdivia founds Santiago in Chile. 1541: An Algerian military campaign by Charles V of Spain (Habsburg) is unsuccessful. 1541: Amazon River is encountered and explored by Francisco de Orellana. 1541: Capture of Buda and the absorption of the major part of Hungary by the Ottoman Empire. 1541: Sahib I Giray of Crimea invades Russia. 1542: The Italian War of 1542–1546 War resumes between Francis I of France and Emperor Charles V. This time Henry VIII is allied with the Emperor, while James V of Scotland and Sultan Suleiman I are allied with the French. 1542: Akbar The Great is born in the Rajput Umarkot Fort 1542: Spanish explorer Ruy López de Villalobos named the island of Samar and Leyte Las Islas Filipinas honoring Philip II of Spain and became the official name of the archipelago. 1543: Ethiopian/Portuguese troops defeat the Adal army led by Imam Ahmad Gurey at the Battle of Wayna Daga; Imam Ahmad Gurey is killed at this battle. 1543: Copernicus publishes his theory that the Earth and the other planets revolve around the Sun 1543: The Nanban trade period begins after Portuguese traders make contact with Japan. 1544: The French defeat an Imperial–Spanish army at the Battle of Ceresole.Scenes of everyday life in Ming China, by Qiu Ying 1544: Battle of the Shirts in Scotland. The Frasers and Macdonalds of Clan Ranald fight over a disputed chiefship; reportedly, 5 Frasers and 8 Macdonalds survive. 1545: Songhai forces sack the Malian capital of Niani 1545: The Council of Trent meets for the first time in Trent (in northern Italy). 1546: Michelangelo Buonarroti is made chief architect of St. Peter's Basilica. 1546: Francis Xavier works among the peoples of Ambon, Ternate and Morotai (Moro) laying the foundations for a permanent mission. (to 1547) 1547: Henry VIII dies in the Palace of Whitehall on 28 January at the age of 55. 1547: Francis I dies in the Château de Rambouillet on 31 March at the age of 52. 1547: Edward VI becomes King of England and Ireland on 28 January and is crowned on 20 February at the age of 9. 1547: Emperor Charles V decisively dismantles the Schmalkaldic League at the Battle of Mühlberg. 1547: Grand Prince Ivan the Terrible is crowned tsar of (All) Russia, thenceforth becoming the first Russian tsar. 1548: Battle of Uedahara: Firearms are used for the first time on the battlefield in Japan, and Takeda Shingen is defeated by Murakami Yoshikiyo. 1548: Askia Daoud, who reigned from 1548 to 1583, establishes public libraries in Timbuktu (in present-day Mali). 1548: The Ming dynasty government of China issues a decree banning all foreign trade and closes down all seaports along the coast; these Hai jin laws came during the Wokou wars with Japanese pirates. 1549: Tomé de Sousa establishes Salvador in Bahia, north-east of Brazil. 1549: Arya Penangsang with the support of his teacher, Sunan Kudus, avenges the death of Raden Kikin by sending an envoy named Rangkud to kill Sunan Prawoto by Keris Kyai Satan Kober (in present-day Indonesia). Main article: 1550s The Islamic gunpowder empires: Mughal Army artillerymen during the reign of Jalaluddin Akbar 1550: The architect Mimar Sinan builds the Süleymaniye Mosque in Istanbul. 1550: Mongols led by Altan Khan invade China and besiege Beijing. 1550–1551: Valladolid debate concerning the human rights of the Indigenous people of the Americas. 1551: Fifth outbreak of sweating sickness in England. John Caius of Shrewsbury writes the first full contemporary account of the symptoms of the disease. 1551: North African pirates enslave the entire population of the Maltese island Gozo, between 5,000 and 6,000, sending them to Libya. 1552: Russia conquers the Khanate of Kazan in central Asia. 1552: Jesuit China Mission, Francis Xavier dies. 1553: Mary Tudor becomes the first queen regnant of England and restores the Church of England under Papal authority. 1553: The Portuguese found a settlement at Macau. 1554: Missionaries José de Anchieta and Manuel da Nóbrega establishes São Paulo, southeast Brazil. 1554: Princess Elizabeth is imprisoned in the Tower of London upon the orders of Mary I for suspicion of being involved in the Wyatt rebellion. 1555: The Muscovy Company is the first major English joint stock trading company. 1556: Publication in Venice of Delle Navigiationi et Viaggi (terzo volume) by Giovanni Battista Ramusio, secretary of Council of Ten, with plan La Terra de Hochelaga, an illustration of the Hochelaga.[13] 1556: The Shaanxi earthquake in China is history's deadliest known earthquake during the Ming dynasty. 1556: Georgius Agricola, the "Father of Mineralogy", publishes his De re metallica. 1556: Akbar defeats Hemu at the Second battle of Panipat. 1556: Russia conquers the Astrakhan Khanate. 1556–1605: During his reign, Akbar expands the Mughal Empire in a series of conquests (in the Indian subcontinent).Political map of the world in 1556 1556: Mir Chakar Khan Rind captures Delhi with Humayun. 1556: Pomponio Algerio, radical theologian, is executed by boiling in oil as part of the Roman Inquisition. 1557: Habsburg Spain declares bankruptcy. Philip II of Spain had to declare four state bankruptcies in 1557, 1560, 1575 and 1596. 1557: The Portuguese settle in Macau (on the western side of the Pearl River Delta across from present-day Hong Kong). 1557: The Ottomans capture Massawa, all but isolating Ethiopia from the rest of the world. 1558: Elizabeth Tudor becomes Queen Elizabeth I at age 25. 1558–1603: The Elizabethan era is considered the height of the English Renaissance. 1558–1583: Livonian War between Poland, Grand Principality of Lithuania, Sweden, Denmark and Russia. 1558: After 200 years, the Kingdom of England loses Calais to France. 1559: With the Peace of Cateau Cambrésis, the Italian Wars conclude. 1559: Sultan Hairun of Ternate (in present-day Indonesia) protests the Portuguese's Christianisation activities in his lands. Hostilities between Ternate and the Portuguese. Main article: 1560s The Mughal Emperor Akbar shoots the Rajput warrior Jaimal during the Siege of Chittorgarh in 1567 1560: Ottoman navy defeats the Spanish fleet at the Battle of Djerba. 1560: Elizabeth Bathory is born in Nyirbator, Hungary. 1560: By winning the Battle of Okehazama, Oda Nobunaga becomes one of the pre-eminent warlords of Japan. 1560: Jeanne d'Albret declares Calvinism the official religion of Navarre. 1560: Lazarus Church, Macau 1561: Sir Francis Bacon is born in London. 1561: The fourth battle of Kawanakajima between the Uesugi and Takeda at Hachimanbara takes place. 1561: Guido de Bres draws up the Belgic Confession of Protestant faith. 1562: Mughal emperor Akbar reconciles the Muslim and Hindu factions by marrying into the powerful Rajput Hindu caste. 1562–1598: French Wars of Religion between Catholics and Huguenots. 1562: Massacre of Wassy and Battle of Dreux in the French Wars of Religion. 1562: Portuguese Dominican priests build a palm-trunk fortress which Javanese Muslims burned down the following year. The fort was rebuilt from more durable materials and the Dominicans commenced the Christianisation of the local population.[12] 1563: Plague outbreak claimed 80,000 people in Elizabethan England. In London alone, over 20,000 people died of the disease. 1564: Galileo Galilei born on February 15 1564: William Shakespeare baptized 26 April 1565: Deccan sultanates defeat the Vijayanagara Empire at the Battle of Talikota. 1565: Mir Chakar Khan Rind dies at aged 97. 1565: Estácio de Sá establishes Rio de Janeiro in Brazil. 1565: The Hospitallers, a Crusading Order, defeat the Ottoman Empire at the siege of Malta (1565). 1565: Miguel López de Legazpi establishes in Cebu the first Spanish settlement in the Philippines starting a period of Spanish colonization that would last over three hundred years. 1565: Spanish navigator Andres de Urdaneta discovers the maritime route from Asia to the Americas across the Pacific Ocean, also known as the tornaviaje. 1565: Royal Exchange is founded by Thomas Gresham. 1566: Suleiman the Magnificent, ruler of the Ottoman Empire, dies on September 7, during the battle of Szigetvar.Siege of Valenciennes during the Dutch War of Independence in 1567 1566–1648: Eighty Years' War between Spain and the Netherlands. 1566: Da le Balle Contrade d'Oriente, composed by Cipriano de Rore. 1567: After 45 years' reign, Jiajing Emperor died in the Forbidden City, Longqing Emperor ascended the throne of Ming dynasty. 1567: Mary, Queen of Scots, is imprisoned by Elizabeth I. 1568: The Transylvanian Diet, under the patronage of the prince John Sigismund Zápolya, the former king of Hungary, inspired by the teachings of Ferenc Dávid, the founder of the Unitarian Church of Transylvania, promulgates the Edict of Torda, the first law of freedom of religion and of conscience in the World. 1568–1571: Morisco Revolt in Spain. 1568–1600: The Azuchi-Momoyama period in Japan. 1568: Hadiwijaya sent his adopted son and son in-law Sutawijaya, who would later become the first ruler of the Mataram dynasty of Indonesia, to kill Arya Penangsang. 1569: Rising of the North in England. 1569: Mercator 1569 world map published by Gerardus Mercator. 1569: The Polish–Lithuanian Commonwealth is created with the Union of Lublin which lasts until 1795. 1569: Peace treaty signed by Sultan Hairun of Ternate and Governor Lopez De Mesquita of Portugal. Main article: 1570s The Battle of Lepanto 1570: Ivan the Terrible, tsar of Russia, orders the massacre of inhabitants of Novgorod. 1570: Pope Pius V issues Regnans in Excelsis, a papal bull excommunicating all who obeyed Elizabeth I and calling on all Catholics to rebel against her. 1570: Sultan Hairun of Ternate (in present-day Indonesia) is killed by the Portuguese.[12] Babullah becomes the next Sultan. 1570: 20,000 inhabitants of Nicosia in Cyprus were massacred and every church, public building, and palace was looted. Cyprus fell to the Ottoman Turks the following year. 1571: Pope Pius V completes the Holy League as a united front against the Ottoman Turks, responding to the fall of Cyprus to the Ottomans. 1571: The Spanish-led Holy League navy destroys the Ottoman Empire navy at the Battle of Lepanto. 1571: Crimean Tatars attack and sack Moscow, burning everything but the Kremlin. 1571: American Indians kill Spanish missionaries in what would later be Jamestown, Virginia. 1571: Spanish conquistador Miguel López de Legazpi establishes Manila, Philippines as the capital of the Spanish East Indies. 1572: Brielle is taken from Habsburg Spain by Protestant Watergeuzen in the Capture of Brielle, in the Eighty Years' War. 1572: Spanish conquistadores apprehend the last Inca leader Tupak Amaru at Vilcabamba, Peru, and execute him in Cuzco. 1572: Jeanne d'Albret dies aged 43 and is succeeded by Henry of Navarre. 1572: Catherine de' Medici instigates the St. Bartholomew's Day massacre which takes the lives of Protestant leader Gaspard de Coligny and thousands of Huguenots. The violence spreads from Paris to other cities and the countryside. 1572: First edition of the epic The Lusiads of Luís Vaz de Camões, three years after the author returned from the East.[14] 1572: The 9 years old Taizi, Zhu Yijun ascended the throne of Ming dynasty, known as Wanli Emperor. 1573: After heavy losses on both sides the siege of Haarlem ends in a Spanish victory.St. Bartholomew's Day massacre of French Protestants 1574: in the Eighty Years' War the capital of Zeeland, Middelburg declares for the Protestants. 1574: After a siege of 4 months the siege of Leiden ends in a comprehensive Dutch rebel victory. 1575: Oda Nobunaga finally captures Nagashima fortress. 1575: Following a five-year war, the Ternateans under Sultan Babullah defeated the Portuguese. 1576: Tahmasp I, Safavid shah, dies. 1576: The Battle of Haldighati is fought between the ruler of Mewar, Maharana Pratap and the Mughal Empire's forces under Emperor Akbar led by Raja Man Singh. 1576: Sack of Antwerp by badly paid Spanish soldiers. 1577–1580: Francis Drake circles the world. 1577: Ki Ageng Pemanahan built his palace in Pasargede or Kotagede. 1578: King Sebastian of Portugal is killed at the Battle of Alcazarquivir. 1578: The Portuguese establish a fort on Tidore but the main centre for Portuguese activities in Maluku becomes Ambon.[12] 1578: Sonam Gyatso is conferred the title of Dalai Lama by Tumed Mongol ruler, Altan Khan. Recognised as the reincarnation of two previous Lamas, Sonam Gyatso becomes the third Dalai Lama in the lineage.[15] 1578: Governor-General Francisco de Sande officially declared war against Brunei in 1578, starting the Castilian War of 1578. 1579: The Union of Utrecht unifies the northern Netherlands, a foundation for the later Dutch Republic. 1579: The Union of Arras unifies the southern Netherlands, a foundation for the later states of the Spanish Netherlands, the Austrian Netherlands and Belgium.The Irish Gaelic chieftain's feast, from The Image of Ireland 1579: The British navigator Sir Francis Drake passes through Maluku and transit in Ternate on his circumnavigation of the world. The Portuguese establish a fort on Tidore but the main centre for Portuguese activities in Maluku becomes Ambon.[16] Main article: 1580s The fall of Spanish Armada 1580: Drake's royal reception after his attacks on Spanish possessions influences Philip II of Spain to build up the Spanish Armada. English ships in Spanish harbours are impounded. 1580: Spain unifies with Portugal under Philip II. The struggle for the throne of Portugal ends the Portuguese Empire. The Spanish and Portuguese crowns are united for 60 years, i.e. until 1640. 1580–1587: Nagasaki comes under control of the Jesuits. 1581: Dutch Act of Abjuration, declaring abjuring allegiance to Philip II of Spain. 1581: Bayinnaung dies at the age of 65. 1582: Oda Nobunaga commits seppuku during the Honnō-ji Incident coup by his general, Akechi Mitsuhide. 1582: Pope Gregory XIII issues the Gregorian calendar. The last day of the Julian calendar was Thursday, 4 October 1582 and this was followed by the first day of the Gregorian calendar, Friday, 15 October 1582 1582: Yermak Timofeyevich conquers the Siberia Khanate on behalf of the Stroganovs. 1583: Denmark builds the world's first theme park, Bakken. 1583: Death of Sultan Babullah of Ternate. 1584–1585: After the siege of Antwerp, many of its merchants flee to Amsterdam. According to Luc-Normand Tellier, "At its peak, between 1510 and 1557, Antwerp concentrated about 40% of the world trade...It is estimated that the port of Antwerp was earning the Spanish crown seven times more revenues than the Americas."[17] 1584: Ki Ageng Pemanahan died. Sultan Pajang raised Sutawijaya, son of Ki Ageng Pemanahan as the new ruler in Mataram, titled "Loring Ngabehi Market" (because of his home in the north of the market). 1585: Akbar annexes Kashmir and adds it to the Kabul SubahPortuguese fusta in India from a book by Jan Huygen van Linschoten 1585: Colony at Roanoke founded in North America. 1585–1604: The Anglo-Spanish War is fought on both sides of the Atlantic. 1587: Mary, Queen of Scots is executed by Elizabeth I. 1587: The reign of Abbas I marks the zenith of the Safavid dynasty. 1587: Troops that would invade Pajang Mataram Sultanate storm ravaged the eruption of Mount Merapi. Sutawijaya and his men survived. 1588: Mataram into the kingdom with Sutawijaya as Sultan, titled "Senapati Ingalaga Sayidin Panatagama" means the warlord and cleric Manager Religious Life. 1588: England repulses the Spanish Armada. 1589: Spain repulses the English Armada. 1589: Catherine de' Medici dies at aged 69. Main articles: 1590s and 1600s Abu'l-Fazl ibn Mubarak presenting Akbarnama to Mughal Azam Akbar, Mughal miniature 1590: Siege of Odawara: the Go-Hojo clan surrender to Toyotomi Hideyoshi, and Japan is unified. 1591: Gazi Giray leads a huge Tatar expedition against Moscow. 1591: In Mali, Moroccan forces of the Sultan Ahmad al-Mansur led by Judar Pasha defeat the Songhai Empire at the Battle of Tondibi. 1592–1593: John Stow reports 10,675 plague deaths in London, a city of approximately 200,000 people. 1592–1598: Korea, with the help of Ming dynasty China, repels two Japanese invasions. 1593–1606: The Long War between the Habsburg monarchy and the Ottoman Turks. 1594: St. Paul's College, Macau, founded by Alessandro Valignano. 1595: First Dutch expedition to Indonesia sets sail for the East Indies with two hundred and forty-nine men and sixty-four cannons led by Cornelis de Houtman.[18] 1596: Birth of René Descartes. 1596: June, de Houtman's expedition reaches Banten the main pepper port of West Java where they clash with both the Portuguese and Indonesians. It then sails east along the north coast of Java losing twelve crew to a Javanese attack at Sidayu and killing a local ruler in Madura.[18] 1597: Romeo and Juliet is published. 1597: Cornelis de Houtman's expedition returns to the Netherlands with enough spices to make a considerable profit.[18] 1598: The Edict of Nantes ends the French Wars of Religion. 1598: Abbas I moves Safavids capital from Qazvin to Isfahan in 1598. 1598–1613: Russia descends into anarchy during the Time of Troubles. 1598: The Portuguese require an armada of 90 ships to put down a Solorese uprising.[12] (to 1599) 1598: More Dutch fleets leave for Indonesia and most are profitable.[18]Edo period screen depicting the Battle of Sekigahara 1598: The province of Santa Fe de Nuevo México is established in Northern New Spain. The region would later become a territory of Mexico, the New Mexico Territory in the United States, and the US State of New Mexico. 1598: Death of Toyotomi Hideyoshi, known as the unifier of Japan. 1599: The Mali Empire is defeated at the Battle of Jenné. 1599: The van Neck expedition returns to Europe. The expedition makes a 400 per cent profit.[18] (to 1600) 1599: March, Leaving Europe the previous year, a fleet of eight ships under Jacob van Neck was the first Dutch fleet to reach the 'Spice Islands' of Maluku.[18] 1600: Giordano Bruno is burned at the stake for heresy in Rome.Siege of Fiľakovo castle during the Long Turkish War 1600: Battle of Sekigahara in Japan. End of the Warring States period and beginning of the Edo period. 1600: The Portuguese win a major naval battle in the bay of Ambon.[19] Later in the year, the Dutch join forces with the local Hituese in an anti-Portuguese alliance, in return for which the Dutch would have the sole right to purchase spices from Hitu.[19] 1600: Elizabeth I grants a charter to the British East India Company beginning the English advance in Asia. 1600: Michael the Brave unifies the three principalities: Wallachia, Moldavia and Transylvania after the Battle of Șelimbăr from 1599. For later events, see Timeline of the 17th century. Polybius' The Histories translated into Italian, English, German and French.[20] Mississippian culture disappears. Medallion rug, variant Star Ushak style, Anatolia (modern Turkey), is made. It is now kept at the Saint Louis Art Museum. Hernan Cortes (1485–1547) Henry VIII, (1491–1547) King of England and Ireland Don Fernando Álvarez de Toledo (1507–1582) Suleiman the Magnificent, Sultan of the Ottoman Empire (1520–1566) Ivan IV the Terrible (1530–1584) Oda Nobunaga (1534–1582) Sir Francis Drake (c. 1540 – 1596) Alberico Gentili, (1552–1608) the Father of international law Philip II of Spain, King of Spain (1556–1598) Akbar the Great, Mughal emperor (1556–1605) Related article: List of 16th century inventions. The Columbian Exchange introduces many plants, animals and diseases to the Old and New Worlds. Introduction of the spinning wheel revolutionizes textile production in Europe. The letter J is introduced into the English alphabet. 1500: First portable watch is created by Peter Henlein of Germany.The Iberian Union in 1598, under Philip II, King of Spain and Portugal 1513: Juan Ponce de León sights Florida and Vasco Núñez de Balboa sights the eastern edge of the Pacific Ocean. 1519–1522: Ferdinand Magellan and Juan Sebastián Elcano lead the first circumnavigation of the world. 1519–1540: In America, Hernando de Soto expeditions map the Gulf of Mexico coastline and bays. 1525: Modern square root symbol (√) 1540: Francisco Vásquez de Coronado sights the Grand Canyon. 1541–42: Francisco de Orellana sails the length of the Amazon River. 1542–43: Firearms are introduced into Japan by the Portuguese. 1543: Copernicus publishes his theory that the Earth and the other planets revolve around the Sun 1545: Theory of complex numbers is first developed by Gerolamo Cardano of Italy. 1558: Camera obscura is first used in Europe by Giambattista della Porta of Italy. 1559–1562: Spanish settlements in Alabama/Florida and Georgia confirm dangers of hurricanes and local native warring tribes. 1565: Spanish settlers outside New Spain (Mexico) colonize Florida's coastline at St. Augustine. 1565: Invention of the graphite pencil (in a wooden holder) by Conrad Gesner. Modernized in 1812. 1568: Gerardus Mercator creates the first Mercator projection map. 1572: Supernova SN 1572 is observed by Tycho Brahe in the Milky Way. 1582: Gregorian calendar is introduced in Europe by Pope Gregory XIII and adopted by Catholic countries. c. 1583: Galileo Galilei of Pisa, Italy identifies the constant swing of a pendulum, leading to development of reliable timekeepers. 1585: earliest known reference to the 'sailing carriage' in China. 1589: William Lee invents the stocking frame. 1591: First flush toilet is introduced by Sir John Harrington of England, the design published under the title 'The Metamorphosis of Ajax'. 1593: Galileo Galilei invents a thermometer. 1596: William Barents discovers Spitsbergen. 1597: Opera in Florence by Jacopo Peri. Entertainment in the 16th century ^ a b Modern reference works on the period tend to follow the introduction of the Gregorian calendar for the sake of clarity; thus NASA's lunar eclipse catalogue states "The Gregorian calendar is used for all dates from 1582 Oct 15 onwards. Before that date, the Julian calendar is used." For dates after 15 October 1582, care must be taken to avoid confusion of the two styles. ^ de Vries, Jan (14 September 2009). "The limits of globalization in the early modern world". The Economic History Review. 63 (3): 710–733. CiteSeerX 10.1.1.186.2862. doi:10.1111/j.1468-0289.2009.00497.x. JSTOR 40929823. S2CID 219969360. SSRN 1635517. ^ Singh, Sarina; Lindsay Brown; Paul Clammer; Rodney Cocks; John Mock (2008). Pakistan & the Karakoram Highway. Vol. 7, illustrated. Lonely Planet. p. 137. ISBN 978-1-74104-542-0. Retrieved 23 August 2010. ^ Babur (2006). Babur Nama. Penguin Books. p. vii. 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An Encyclopedia of World History (5th ed. 1973); highly detailed outline of events online free Media related to 16th century at Wikimedia Commons Timelines of 16th century events, science, culture and persons Retrieved from " 4 The following pages link to 16th century External tools (link count transclusion count sorted list) · See help page for transcluding these entries Showing 50 items. View (previous 50 | next 50) (20 | 50 | 100 | 250 | 500)Bagpipes (links | edit) List of decades, centuries, and millennia (links | edit) Fashion (links | edit) Giovanni Boccaccio (links | edit) History of Mali (links | edit) History of Mauritius (links | edit) Post office (links | edit) Snare drum (links | edit) Republican Party (United States) (links | edit) 20th century (links | edit) 15th century (links | edit) 17th century (links | edit) 18th century (links | edit) 1624 (links | edit) 1626 (links | edit) 1642 (links | edit) 1661 (links | edit) 1608 (links | edit) 1492 (links | edit) 14th century (links | edit) 1st century (links | edit) 13th century (links | edit) 4th century (links | edit) 12th century (links | edit) 11th century (links | edit) 1564 (links | edit) 1648 (links | edit) 1572 (links | edit) 1623 (links | edit) 1662 (links | edit) 1490s (links | edit) 1640s (links | edit) 1597 (links | edit) 1690 (links | edit) 1688 (links | edit) 7th century (links | edit) 10th century (links | edit) 9th century (links | edit) 8th century (links | edit) 6th century (links | edit) 5th century (links | edit) 3rd century (links | edit) 2nd century (links | edit) 1573 (links | edit) 1570s (links | edit) 1574 (links | edit) 1436 (links | edit) 1476 (links | edit) 1542 (links | edit) 1540s (links | edit) View (previous 50 | next 50) (20 | 50 | 100 | 250 | 500) Retrieved from " WhatLinksHere/16th_century" An ecosystem is a community of living organisms – like plants, animals, and bacteria – interacting with their non-living environment, such as air, water, and soil. These interactions create a balanced system where each part plays an important role.Why Are Ecosystems Important?Ecosystems support all life on Earth by providing essential resources like food, water, and oxygen. They help regulate climate, recycle nutrients, and maintain biodiversity, which is the variety of life in a given area. Without healthy ecosystems, life as we know it would not exist.Key Concepts of an EcosystemLiving Organisms (Biotic Factors) – These include plants, animals, fungi, and microorganisms. Each species has a role, such as producers (plants), consumers (animals), and decomposers (fungi and bacteria).Non-Living Environment (Abiotic Factors) – Elements like sunlight, water, temperature, and soil influence how organisms survive and interact.Habitat – The natural home of an organism, like forests for tigers or oceans for fish.Energy Flow – Sunlight is the primary energy source, powering plants that feed herbivores, which in turn are eaten by carnivores.Biodiversity – A rich variety of species makes an ecosystem stronger and more resilient to changes like climate shifts or natural disasters.The Amazon Rainforest is one of the world's most diverse ecosystems. It is home to millions of species, from towering trees to tiny insects. The rainforest absorbs carbon dioxide, produces oxygen, and regulates the Earth's climate, making it vital to global health.What Is An Ecosystem? | Ecology & Environment | Biology | FuseSchoolComponents of an EcosystemAn ecosystem is made up of two main parts – biotic factors (living things) and abiotic factors (non-living things). These components interact constantly, creating a balanced environment where organisms survive and thrive.Biotic factors include all living organisms in an ecosystem, from tiny bacteria to large animals. Each plays a role in the food chain and ecosystem balance.Types of Biotic FactorsProducers (Plants) – Green plants, algae, and some bacteria make their own food through photosynthesis. They provide energy for other organisms.Consumers (Animals) – These organisms eat plants or other animals to get energy. Herbivores (like deer) eat plants, carnivores (like lions) eat other animals, and omnivores (like bears) eat both.Decomposers (Fungi & Bacteria) – These break down dead plants and animals, returning nutrients to the soil for new growth. Example – In a forest ecosystem, trees (producers) provide food for deer (herbivores), which are eaten by wolves (carnivores). Fungi and bacteria decompose dead plants and animals, recycling nutrients into the soil for new trees to grow.Abiotic factors are the physical and chemical elements that affect life in an ecosystem. These include –Water – Essential for all life, water supports plant growth and animal hydration.Temperature – Determines which organisms can survive in an area (e.g., polar bears in the Arctic, cacti in the desert).Soil – Provides nutrients for plants and habitat for microorganisms.Sunlight – Powers photosynthesis, the process plants use to make food.Oxygen & Carbon Dioxide – Oxygen is needed for animals to breathe, while carbon dioxide helps plants grow. Example – In a desert ecosystem, limited water, high temperatures, and sandy soil shape the environment. Cacti store water, while animals like camels and lizards have adapted to survive in extreme conditions.Biotic and abiotic factors work together to create a stable ecosystem. Plants need sunlight, water, and nutrients to grow, which in turn supports herbivores and carnivores. Decomposers break down organic matter, returning nutrients to the soil. Example – In a pond ecosystem, fish rely on oxygen in the water to breathe, while aquatic plants need sunlight for photosynthesis. The temperature of the water affects which species can live there.Types of EcosystemsEcosystems can be classified into three main types – terrestrial (land-based), aquatic (water-based), and artificial (human-made). Each type has unique characteristics and supports different forms of life.Terrestrial Ecosystems (Land-Based)Terrestrial ecosystems exist on land and vary based on climate, soil, and plant life.Examples of Terrestrial Ecosystems –Forest Ecosystem – Found in tropical rainforests, temperate forests, and boreal forests. These ecosystems have a rich variety of trees, animals like monkeys, deer, and owls, and a high level of biodiversity.Desert Ecosystem – Characterized by extreme temperatures and low rainfall. Plants like cacti store water, and animals like camels and lizards have adapted to survive harsh conditions.Grassland Ecosystem – Open landscapes dominated by grasses with few trees. Examples include the African savanna, home to lions, elephants, and zebras, and the North American prairies, where bison and foxes thrive.Tundra Ecosystem – Found in cold regions like the Arctic, with frozen soil and little vegetation. Animals like polar bears, arctic foxes, and reindeer are adapted to survive extreme cold.Aquatic Ecosystems (Water-Based)Aquatic ecosystems exist in freshwater or saltwater environments, supporting marine and freshwater life.Examples of Aquatic Ecosystems –Marine Ecosystem – Covers oceans and seas, supporting life from tiny plankton to giant whales. Coral reefs, like Australia's Great Barrier Reef, are home to colorful fish, sea turtles, and sharks.Freshwater Ecosystem – Includes rivers, lakes, and ponds. These ecosystems support fish, amphibians like frogs, and aquatic plants such as water lilies. The Amazon River Basin is one of the most diverse freshwater ecosystems.Artificial Ecosystems (Human-Made)Artificial ecosystems are created or controlled by humans. While they may mimic natural ecosystems, they rely on human intervention.Examples of Artificial Ecosystems –Urban Parks – Green spaces in cities that provide habitats for birds, squirrels, and insects.Aquariums and Botanical Gardens – Designed to support specific species of plants and animals under controlled conditions.Farmlands – Cultivated land where humans grow crops and raise livestock.How Ecosystems FunctionEcosystems work by transferring energy and recycling nutrients to keep everything in balance. The movement of energy and matter through an ecosystem happens through food chains, food webs, and nutrient cycles.Energy Flow in an EcosystemEnergy in an ecosystem starts with the Sun and moves through different organisms in a process called the trophic system.How Energy MovesProducers (Plants & Algae) – Use sunlight to make their own food through photosynthesis.Consumers (Animals) – Eat plants or other animals for energy.Herbivores (Primary Consumers) – Eat plants (e.g., rabbits, deer).Carnivores (Secondary & Tertiary Consumers) – Eat other animals (e.g., snakes, wolves).Omnivores – Eat both plants and animals (e.g., bears, humans).Decomposers (Fungi & Bacteria) – Break down dead plants and animals, returning nutrients to the soil.Energy PyramidAn energy pyramid shows how energy decreases as it moves up the food chain. Producers have the most energy, while top predators have the least because energy is lost at each level.Food Chains and Food WebsA food chain is a simple path of energy transfer. For example –☀ Sun → Grass (Producer) → Grasshopper (Primary Consumer) → Frog (Secondary Consumer) → Snake (Tertiary Consumer) → Eagle (Top Predator)A food web is a more realistic model that connects multiple food chains, showing how organisms eat more than one type of food. Example – In an ocean ecosystem, phytoplankton (tiny plants) are eaten by small fish, which are eaten by larger fish, and then sharks. But those small fish may also be eaten by birds or squid, creating a food web.Nutrient Cycles – Recycling MatterUnlike energy, which flows in one direction, nutrients cycle through ecosystems, allowing organisms to reuse essential elements.Important Nutrient CyclesCarbon Cycle – Plants take in carbon dioxide (CO_2) from the air for photosynthesis, animals release CO_2 by breathing, and decomposers return carbon to the soil.Nitrogen Cycle – Bacteria in the soil convert nitrogen from the air into a form plants can use. Animals get nitrogen by eating plants, and decomposers return it to the soil.Human Impact on EcosystemsHuman activities have a significant effect on ecosystems. While nature has a way of maintaining balance, pollution, deforestation, and climate change are causing serious harm. Understanding these impacts helps us take action to protect the environment.How Humans Harm EcosystemsPollutionFactories, cars, and waste products release harmful chemicals into the air, water, and soil. Example – Plastic pollution in oceans harms marine life like sea turtles and fish.DeforestationCutting down forests for farmland, cities, or industries destroys habitats and reduces biodiversity. Example – The Amazon Rainforest is shrinking due to logging and agriculture, endangering species like jaguars and toucans.Habitat DestructionBuilding roads, dams, and cities replaces natural ecosystems with human developments, leaving animals with nowhere to live. Example – Wetlands are drained for farming, destroying habitats for birds, fish, and amphibians.Climate Change & Global WarmingBurning fossil fuels releases carbon dioxide (CO_2), trapping heat in the atmosphere. This leads to rising temperatures, extreme weather, and loss of species. Example – Melting Arctic ice threatens polar bears by reducing their hunting grounds.Protecting and Restoring EcosystemsDespite these challenges, conservation efforts can help ecosystems recover.Ways to Protect Ecosystems Reforestation – Planting trees to restore lost forests and absorb CO_2. Reducing Waste – Recycling and using reusable products to cut down on pollution. Sustainable Practices – Using renewable energy (like solar and wind power) instead of fossil fuels. Wildlife Protection – Creating national parks and protected areas to preserve natural habitats.What Can You Do?▯ Plant trees in your neighborhood. ▯ Reduce plastic use by choosing reusable bottles and bags. ▯ Save energy by turning off lights and electronics when not in use. ♻ Recycle paper, plastic, and glass to prevent waste from ending up in landfills.Importance of Ecosystem ConservationEcosystems are essential for life on Earth. They provide food, clean air, water, and shelter for millions of species, including humans. Protecting ecosystems helps maintain biodiversity, natural resources, and ecological balance, ensuring a healthy planet for future generations.Why Ecosystems MatterEcosystems support a wide variety of plants, animals, and microorganisms. A diverse ecosystem is more resilient to environmental changes and disasters. Example – Coral reefs, known as the "rainforests of the sea," provide shelter for thousands of marine species.Ecosystem ServicesNature provides essential services like pollination, oxygen production, and water purification. Example – Bees and butterflies pollinate crops, helping grow fruits and vegetables.Natural ResourcesForests, rivers, and oceans provide food, medicine, and materials for daily life. Overuse and destruction of these resources can lead to scarcity and environmental damage. Example – The Amazon Rainforest produces 20% of the world's oxygen and helps regulate global climate.How to Protect EcosystemsConservation Methods & Sustainable Practices Protected Areas – National parks and wildlife reserves safeguard species and their habitats. Reforestation – Planting trees restores forests and reduces carbon dioxide in the atmosphere. Sustainable Practices – Using renewable energy, reducing plastic waste, and conserving water help protect ecosystems. Wildlife Conservation – Protecting endangered species and stopping illegal hunting preserves biodiversity.Real-World Conservation Efforts Yellowstone National Park (USA) – Home to wolves, bears, and bison, this park protects North America's wildlife. The Great Green Wall (Africa) – A reforestation project aiming to stop desertification in the Sahara. Giant Panda Conservation (China) – Due to conservation efforts, pandas have moved from "endangered" to "vulnerable" status.What Can You Do?Even small actions can make a big difference! Plant trees in your community. Reduce waste by recycling and using reusable items. Save water by turning off taps when not in use. Support conservation programs by learning about endangered species and donating to wildlife organizations. ⚡ Use less energy by turning off lights and electronics when not needed.FAQ's An ecosystem is a geographic area where living organisms such as plants, animals, and other organisms, along with weather and landscapes, work together to form a bubble of life. An ecosystem comprises biotic components, which include all living organisms, and abiotic components, encompassing non-living elements like climate, soil, water, and sunlight. In an ecosystem, energy flows from primary producers (like plants) to various consumers (herbivores, carnivores) and decomposers, forming a food web. Nutrient cycles involve the recycling of elements such as carbon and nitrogen between organisms and their physical environment. A habitat refers to the specific environment where a particular species lives, whereas an ecosystem encompasses the broader system of interactions between various species and their physical environment within a given area. Yes, ecosystems can range from very small areas, like a pond or a backyard garden, to vast regions such as forests, grasslands, or entire oceans. Producers, like plants, generate energy through photosynthesis. Consumers, such as animals, feed on producers or other consumers. Decomposers, including fungi and bacteria, break down dead organic matter, returning nutrients to the soil. Human activities, including deforestation, pollution, and urbanization, can disrupt ecosystems by altering habitats, reducing biodiversity, and affecting the natural balance of ecological processes. Biodiversity refers to the variety of life within an ecosystem, encompassing the different species of plants, animals, and microorganisms. High biodiversity enhances ecosystem resilience, productivity, and stability, allowing it to better withstand environmental stresses. References and SourcesWikipedia – EcosystemKhan Academy – What is An Ecosystem An ecosystem is a geographic area where plants, animals and other organisms, as well as weather and landscape, work together to form a bubble of life. Ecosystems contain biotic (living) factors, as well as abiotic (nonliving) factors. Biotic factors include plants, animals and other organisms. Abiotic factors include rocks, temperature and humidity.Every part of an ecosystem depends on every other part, directly or indirectly. A change in the temperature of an ecosystem often affects what plants grow there, for instance. Animals that depend on plants for food and shelter have to adapt to the changes, move to another ecosystem or perish.Ecosystems can be very large or very small. Tide pools, the ponds left by the ocean as the tide goes out, are complete, tiny ecosystems. Tide pools contain seaweed, a kind of algae that uses photosynthesis to create food. Herbivores, such as abalone (Haliotis), eat the seaweed. Carnivores, such as sea stars, eat other animals in the tide pool, such as clams or mussels. Tide pools depend on the changing level of ocean water. Organisms in the tide pool must be able to survive submersion in seawater and potentially crushing ocean currents when the tide comes in. When the tide goes back out, the organisms must survive sun exposure and hotter temperatures. Plants and animals in the tidepool have adaptations that help them survive. For example, seaweed has a protective coating to keep it from drying out in the sun. In this way, the biotic parts of the ecosystem depend on abiotic factors.The whole surface of Earth is a series of connected ecosystems. Ecosystems are often connected in a larger biome. Biomes are large sections of land, sea or atmosphere. They are defined by climate, geography and the plants and animals that live there. The five main types of biomes are desert, aquatic, tundra, grassland and forest.Within each biome, there are many different ecosystems. The desert biomes of the world, for instance, include a wide variety of ecosystems. The Sahara has a hot, arid climate and includes oasis ecosystems that have date palm trees (Phoenix dactylifera), fresh water and animals, such as crocodiles. The Sahara also has dune ecosystems, with winds constantly shifting the landscape. Organisms in these ecosystems, such as monitor lizards (Varanus) and fennec foxes (Vulpes zerda), must be able to survive on in sand dunes for long periods of time. The Sahara even includes abiotic factors carried by wind and fog from a marine environment. The Atlantic Ocean creates cool fogs on the Northwest African coast that make their way over the desert.In contrast, the Gobi Desert, which stretches across Mongolia and China, is a cold desert with freezing temperatures. Unlike the Sahara, the Gobi has ecosystems based not in sand, but in bare rock. Some grasses are able to grow in the cold, dry climate. As a result, these Gobi ecosystems have grazing animals, such as the goitered gazelle (Gazella subgutturosa) and even takhi (Equus ferus przewalskii), an endangered species of wild horse that had gone extinct in the wild before being reintroduced in the 20th century. Antarctica is also a cold desert biome. Its thick ice sheet allows only a few mosses – which are nutrient poor – to grow, so animal life, like penguin, whale and seal species, must rely on the ocean for food instead of the land.Threatened EcosystemsHumans are a part of ecosystems too. Generally, Indigenous people have lived as part of their local ecosystems for generations without overusing their resources. For example, the Indigenous communities of North America's Great Plains developed a complex lifestyle centered on the bison (Bison bison), a large grazing animal native to the ecosystem of the Great Plains. The cultural centering of these animals largely occurred after the introduction of horses and firearms by European colonizers. Bison were referred to as "buffalo" by both Indigenous and non-Indigenous people for many years, though their scientific name is bison. Many indigenous people of the Great Plains use the word "buffalo" for the animals in cultural contexts. These tribes used bison hides for their homes and clothing, bison meat for food and bison horn for tools. Bison were also a major part of the Indigenous peoples' spiritual lives, where people honored the animal with ceremonies and prayers. The ecosystem supported tens of millions of bison in the early 1800s as well as tribes, including the Lakota, Blackfeet, Cheyenne and others who depended on the animal for survival.However, in the mid-to-late 1800s, the U.S. government, knowing how central bison were to Indigenous life, implemented "scorched earth" policies that encouraged the military to kill as many bison as possible. This was genocide, an effort to destroy Indigenous culture and take over tribal land in the central and western parts of the present-day United States. By 1900, there were fewer than 1,000 wild bison. This not only harmed Indigenous livelihoods, but it also harmed the ecosystem. As a result of non-Indigenous people settling on the land, much of the Great Plains is now largely farmland and used for cattle. Iit is one of the most threatened ecosystems in the world. Today, Indigenous people are working to conserve the Northern Great Plains ecosystem, as they did in the past. For example, the Eastern Shoshone Tribe has introduced bison back to the ecosystem and are monitoring and caring for the growing herd, among other conservation efforts.Tropical rainforest ecosystems surrounding the Amazon River in South America are also under threat. Tropical rainforests have distinct layers that are defined by the different levels of sunlight they receive, and each of these layers has unique plants and animals. Because of this, each layer of the rainforest can be considered its own smaller ecosystem within the larger rainforest ecosystem.The top layer of the rainforest is called the emergent layer. This is where the tallest trees grow. This layer is exposed to high winds and harsh sun, but still supports animals like birds of prey, monkeys and insects.The canopy is the next layer. This layer also has tall trees, but they are more densely packed together than in the emergent layer. Forest canopies also include other plants, called epiphytes, which grow directly on branches. Examples of epiphytes are mosses, ferns and orchids. Canopies are also home to the majority of rainforest animals, including keel-billed toucans (Ramphastos sulfuratus) and howler monkeys (Alouatta). Below the canopy is the next layer, the understory. The understory is darker, so it supports plants that thrive in the shade. It also supports many insects and some larger animals like snakes. The forest floor layer is even darker. It is filled with decomposing matter like leaves and branches from higher layers, making it easy for animals who do not climb trees to find food. Giant anteaters (Myrmecophaga tridactyla) and other creatures that help break down matter and aerate the soil make their homes there.Indigenous people of the Amazon rainforest live off the land in ways that allow the ecosystem thrive. For example, the Yanomami people that live in the rainforests of Venezuela and Brazil do not live in permanent settlements that might degrade the land. Instead, they farm and hunt in an area until the resources are depleted but not completely used up. They then migrate to another area. This allows the rainforest to replenish itself.However, the rainforest is being destroyed and degraded by people not indigenous to the forest for purposes like farming and mining. International demand—from countries like China and the United State—for beef, rainforest wood and other products has incentivized local farmers and sometimes even South American governments to continue or ignore deforestation. The opportunity to escape poverty incentivizes local people to mine or farm. This is because many countries with rainforests were formerly colonized by Europeans who built economies based on resource extraction. This often left locals impoverished, because colonizing nations depleted the land, did not share extracted resources and did not develop other industries in the colonies. Now, for citizens of formerly colonized nations, it is a challenge to balance the needs of protecting the ecosystem with economic needs and survival.Still, the destruction of the rainforest comes at a very high cost for the ecosystem. Deforestation degrades the soil and creates and spreads deserts. By cutting down trees, deforestation also contributes to greater greenhouse gasses in the air, which warm the atmosphere and contribute to climate change. Animal populations have shrunk, and some species have disappeared altogether. This disrupts the cycle of life in the smaller ecosystems within the rainforest, which can then affect ecosystems in other parts of the rainforest.Deforestation comes at a cost for Indigenous communities too. Indigenous people not only lose their land, they may also lose parts of their culture and knowledge. For example, the Yanomami of the Amazon have a strong history and culture of traditional medicine. Many modern medicines have been developed from rainforest plants, so the Yanomami's knowledge and stewardship of the forest help their people and may allow for new innovation. They live communally and share goods that they produce themselves—all traditions that would be lost without the rainforest ecosystem. Importantly, the rainforest is also culturally significant to the Yanomami. But rainforest loss goes beyond threatening culture for the Yanomami. They are also at risk of dying out completely. The Yanomami have had little contact with other humans, making them more susceptible to disease. Increased contact with miners from outside of their community has resulted in an increased mortality rate among the Yanomami population.Restoring EcosystemsSome ecosystems can be restored after damage or destruction, but it may take considerable effort and many years for an ecosystem to fully recover. In 2022, the United Nations (UN) declared a Decade on Ecosystem Restoration to push national, regional, and local governments and groups to work to restore their local ecosystems.One way to restore ecosystems is to remove the causes of destruction and allow the ecosystem to recover on its own. This typically means cutting down on human involvement and action in the ecosystem. One example of a conservation program that works this way is the Cocos Island National Park, a World Heritage site in Costa Rica. 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Ecuador is home not only to rainforest ecosystems but also mountain ecosystems and the unique ecosystems on the Galapagos Islands.There are many ways global citizens can help ecosystems thrive. The first step is to learn about different ecosystems, both locally and internationally, to determine the best way to help threatened ecosystems. People can support local conservation groups and follow recommendations about how to interact with local wildlife. On a global level, people can be mindful about the source of products they buy and choose to buy more sustainably and support international organizations that protect ecosystems. Additionally, people can consider political action on a local, regional or international level and pressure government officials to improve and preserve the environment. An ecosystem is a geographic area where plants, animals and other organisms, as well as weather and landscape, work together to form a bubble of life. Ecosystems contain biotic (living) factors, as well as abiotic (nonliving) factors. Biotic factors include plants, animals and other organisms. Abiotic factors include rocks, temperature and humidity.Every part of an ecosystem depends on every other part, directly or indirectly. A change in the temperature of an ecosystem often affects what plants grow there, for instance. Animals that depend on plants for food and shelter have to adapt to the changes, move to another ecosystem or perish.Ecosystems can be very large or very small. Tide pools, the ponds left by the ocean as the tide goes out, are complete, tiny ecosystems. Tide pools contain seaweed, a kind of algae that uses photosynthesis to create food. Herbivores, such as abalone (Haliotis), eat the seaweed. Carnivores, such as sea stars, eat other animals in the tide pool, such as clams or mussels. Tide pools depend on the changing level of ocean water. Organisms in the tide pool must be able to survive submersion in seawater and potentially crushing ocean currents when the tide comes in. When the tide goes back out, the organisms must survive sun exposure and hotter temperatures. Plants and animals in the tidepool have adaptations that help them survive. For example, seaweed has a protective coating to keep it from drying out in the sun. In this way, the biotic parts of the ecosystem depend on abiotic factors.The whole surface of Earth is a series of connected ecosystems. Ecosystems are often connected in a larger biome. Biomes are large sections of land, sea or atmosphere. They are defined by climate, geography and the plants and animals that live there. The five main types of biomes are desert, aquatic, tundra, grassland and forest.Within each biome, there are many different ecosystems. The desert biomes of the world, for instance, include a wide variety of ecosystems. The Sahara has a hot, arid climate and includes oasis ecosystems that have date palm trees (Phoenix dactylifera), fresh water and animals, such as crocodiles. The Sahara also has dune ecosystems, with winds constantly shifting the landscape. Organisms in these ecosystems, such as monitor lizards (Varanus) and fennec foxes (Vulpes zerda), must be able to survive on in sand dunes for long periods of time. The Sahara even includes abiotic factors carried by wind and fog from a marine environment. The Atlantic Ocean creates cool fogs on the Northwest African coast that make their way over the desert.In contrast, the Gobi Desert, which stretches across Mongolia and China, is a cold desert with freezing temperatures. Unlike the Sahara, the Gobi has ecosystems based not in sand, but in bare rock. Some grasses are able to grow in the cold, dry climate. As a result, these Gobi ecosystems have grazing animals, such as the goitered gazelle (Gazella subgutturosa) and even takhi (Equus ferus przewalskii), an endangered species of wild horse that had gone extinct in the wild before being reintroduced in the 20th century. Antarctica is also a cold desert biome. Its thick ice sheet allows only a few mosses – which are nutrient poor – to grow, so animal life, like penguin, whale and seal species, must rely on the ocean for food instead of the land.Threatened EcosystemsHumans are a part of ecosystems too. Generally, Indigenous people have lived as part of their local ecosystems for generations without overusing their resources. For example, the Indigenous communities of North America's Great Plains developed a complex lifestyle centered on the bison (Bison bison), a large grazing animal native to the ecosystem of the Great Plains. The cultural centering of these animals largely occurred after the introduction of horses and firearms by European colonizers. Bison were referred to as "buffalo" by both Indigenous and non-Indigenous people for many years, though their scientific name is bison. Many indigenous people of the Great Plains use the word "buffalo" for the animals in cultural contexts. These tribes used bison hides for their homes and clothing, bison meat for food and bison horn for tools. Bison were also a major part of the

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The living parts of an ecosystem are called biotic factors while the environmental factors that they interact with are called abiotic factors. Because living things both respond to and are influenced by their environment, it is important to study both factors together to get a full picture.An ecosystem must contain producers, consumers, decomposers, and dead and inorganic matter. Seals are an example of consumers. They are unable to make their own food and so must eat other animals. Pictured is a Weddell seal (Leptonychotes weddellii).Rights: The University of WaikatoBecause we are talking about interactions, ecosystems can be any size. A puddle on the ground can be as much of an ecosystem as a whole lake, forest, river or desert.Our native forests – ngahere – have complex ecosystems. Within the wider ecosystems are smaller ecosystems, such as the one formed around honeydew.What makes up an ecosystem? An ecosystem is a community of living things and their non-living environment, and may be as large as a desert or as small as a puddle. An ecosystem must contain producers, consumers, decomposers, and dead and inorganic matter. All ecosystems require energy from an external source – this is usually the sun.Rights: The University of Waikato Te Whare Wānanga o WaikatoAn ecosystem must contain producers, consumers, decomposers, and dead and inorganic matter. All ecosystems require energy from an external source – this is usually the sun. Plants need sunlight to photosynthesise and produce glucose, providing an energy source for other organisms. The living organisms in an ecosystem can be described as producers, consumers and decomposers. Producers are the green plants, which make their own food through photosynthesis. Consumers are animals who get their energy by eating other organisms: herbivores eat plants, carnivores eat herbivores or other carnivores, and omnivores eat both plants and animals. Decomposers (including bacteria, fungi, and some plants and animals) break down dead plants and animals into organic materials that go back into the soil.Producers make food from inorganic matter. (Plants are producers – they make sugar through photosynthesis – they use sunlight, water and carbon dioxide to produce food.)Consumers eat producers – they are unable to make their own food and so must eat other plants and animals. (All animals are consumers.)Decomposers break down dead matter – these may be bacteria or animals that feed off dead plants and animals.Inorganic matter is what non-living things are made from. These are things like air, water, rocks, soil and metals. Inorganic matter is important in an ecosystem because it is what producers use, and it is the physical and chemical, non-living environment that we live in.Why is knowing about ecosystems important? The interactions going on are all linked, and they can get very complex. Anything that impacts on one aspect of the ecosystem will, in turn, impact on others. Unfortunately, humans often do things that result in disrupting an ecosystem, and even though their actions may seem small, they can have large effects. For example, the over-fishing of sharks can have catastrophic effects for reef ecosystems. By removing the top level predator, the food it normally eats thrives and then over-populates. This disrupts the whole reef ecosystem, and if balance is not restored, the ecosystem can collapse. This means it is important for humans to consider the consequences of their actions and do their best to change their behaviours when problems are identified.The Antarctic ecosystem Antarctica has both a terrestrial (land) ecosystem and a marine (sea) ecosystem. When we think of Antarctica, we imagine a land of snow and ice, but there are also many different types of plants and animals living there. These living creatures are well adapted to living in extreme cold and in the absence of humans, but human activities can still affect them, even when there are no humans permanently living in Antarctica.Diplasterias burcei, or star fish, can be found throughout the waters near Antarctica. This photo was taken under 5 metres of sea ice in McMurdo Sound, Antarctica.Rights: Henry KaiserNational Science Foundation (U.S.)Visitors to Antarctica (scientists and tourists) need to be careful to do all they can to minimise their disturbance to the Antarctic ecosystem. The cold slows many processes down, wastes take longer to decay and damage takes longer to recover. For this reason, the Antarctic Treaty dictates that all rubbish wastes must be removed from Antarctica and mining for resources is prohibited.But it's not only local disturbances that threaten Antarctica. Human processes such as the burning of fossil fuels have been linked to the greenhouse effect, which may be causing the polar ice to melt and change the climate. Both of these have great potential to do damage to Antarctica.Science both influences society and is influenced by society. Scientific research sometimes uncovers environmental problems that are linked to human lifestyles. This research shows that the way we live needs to be balanced with environmental needs, which sometimes puts scientists in a difficult position in defending their work.Explore the wide range of content we have under our ecosystem concept, remember you can use the filters to narrow your search.Published: 19 July 2007 Science Environment Ask the Chatbot a Question ecosystem, the complex of living organisms, their physical environment, and all their interrelationships in a particular unit of space. A brief treatment of ecosystems follows. For full treatment, see biosphere. An ecosystem can be categorized into its abiotic constituents, including minerals, climate, soil, water, sunlight, and all other nonliving elements, and its biotic constituents, consisting of all its living members. Linking these constituents together are two major forces: the flow of energy through the ecosystem and the cycling of nutrients within the ecosystem. Ecosystems vary in size: some are small enough to be contained within single water droplets while others are large enough to encompass entire landscapes and regions (see biome).(Read E.O. Wilson’s Britannica essay on mass extinction.) The fundamental source of energy in almost all ecosystems is radiant energy from the Sun. The energy of sunlight is used by the ecosystem’s autotrophic, or self-sustaining, organisms (that is, those that can make their own food). Consisting largely of green vegetation, these organisms are capable of photosynthesis—i.e., they can use the energy of sunlight to convert carbon dioxide and water into simple, energy-rich carbohydrates. The autotrophs use the energy stored within the simple carbohydrates to produce the more complex organic compounds, such as proteins, lipids, and starches, that maintain the organisms’ life processes. The autotrophic segment of the ecosystem is commonly referred to as the producer level. Organic matter generated by autotrophs directly or indirectly sustains heterotrophic organisms. Heterotrophs are the consumers of the ecosystem; they cannot make their own food. They use, rearrange, and ultimately decompose the complex organic materials built up by the autotrophs. All animals and fungi are heterotrophs, as are most bacteria and many other microorganisms.