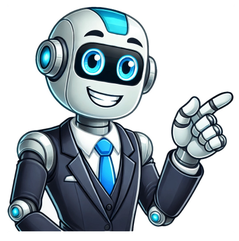
Continue



 The main difference between plant and animal cells is that plant cells are rigid and autotrophic, while animal cells are flexible and heterotrophic. This leads to organelle and structural differences.Plant and animal cells both are eukaryotic cells, meaning they have a defined nucleus and complex structures encased within membranes (organelles). Both cell types share common cellular machinery such as a nucleus, mitochondria, endoplasmic reticulum, ribosomes, and the Golgi apparatus. However, they also exhibit distinct structural differences that define their functions and responses to their environment. Some of these differences include the presence of cell walls and chloroplasts in plant cells, and centrioles and lysosomes in animal cells. The following article delves deep into the nuanced differences between plant and animal cells.Remembering the key differences between plant and animal cells is easier when you think about the roles these cells play.Plant cells are rigid because the stacked cells act as their skeletal system and because they store water and nutrients both for energy and to maintain their structure. Plants are photosynthetic or autotrophs, so their cells contain the necessary organelles for photosynthesis. So, plant cells have a cell wall, a large central storage vacuole, and chloroplasts.Animals, on the other hand, are motile (can move). Movement requires flexibility, so animal cells are not rigid. While they naturally assume a round shape, but allow for changes. Because they lack a cell wall that would give the cells a fixed shape, animal cells need help making certain the chromosomes and cell contents align perfectly for mitosis and meiosis. So, they have centrioles and centrosomes. Animals are heterotrophs, meaning they get their food by eating plants or other animals. So, they lack chloroplasts. Animal cells several smaller vacuoles. Lysosomes in animal cells break down debris. Although plant cells perform this function, they do it a bit differently.Plant and animals cells contain somewhat different organelles, plus there are distinctions between some that they share in common:Plant cells are encased in a rigid cell wall composed mainly of cellulose. This wall not only provides structural support but also protects the cell from mechanical damage. It has a role in preventing excessive water uptake and gives shape to the cell. Animal cells lack this rigid structure; instead, they have a more flexible cell membrane which provides for diverse shapes and facilitates movement in some cells. (Plant cells also have a cell membrane.)Intermediate filaments form the cytoskeleton of many animal cells. For the most part, plant cells lack intermediate filaments because the cell wall and central vacuole keep cell contents in place. In plants cells with intermediate filaments, the structure and function differs from anima cells. In a way, plant cells have an exoskeleton, while animal cells have an endoskeleton.One of the primary distinctions between plant and animal cells is the presence of chloroplasts and other plastids in plant cells. Chloroplasts are the sites of photosynthesis, where light energy is converted into chemical energy in the form of glucose. Containing the pigment chlorophyll, these organelles enable plants to capture light energy. Animal cells do not possess chloroplasts and rely on the intake of organic compounds for energy.Animal cells often contain a centrosome, which includes a pair of centrioles located near the nucleus and cylinders of microtubules. These organelles play a crucial role in cell division by helping in the formation of the spindle fibers that separate chromosomes during mitosis. Although some plant cells have structures similar to centrioles, they generally lack these organelles and have alternative mechanisms for spindle formation during cell division.While both plant and animal cells contain vacuoles, the size, function, and number can differ significantly. In plant cells, a central vacuole often occupies up to 90% of the cell's volume. This vacuole stores nutrients, waste products, and helps in maintaining turgor pressure. Animal cells may have several smaller vacuoles that mainly function in storage, excretion, and intracellular digestion.Predominantly found in animal cells, lysosomes are membrane-bound organelles containing hydrolytic enzymes. These enzymes are essential for breaking down waste materials and cellular debris. Plant cells, on the other hand, have similar structures called lytic vacuoles, which serve a similar function but are structurally different.Both plant and animal cells have ribosomes, which are the site of protein synthesis. However, the ribosomes in chloroplasts of plant cells, which are responsible for synthesizing proteins needed for photosynthesis, are more similar to those found in prokaryotic cells than the ribosomes in the cytoplasm of either plant or animal cells.Plasmodesmata are tiny channels found in plant cells that allow for communication and transport between neighboring cells. Animal cells don't have plasmodesmata; instead, they use structures called gap junctions to facilitate intercellular communication.Present in plant cells, especially in the germinating seeds, glyoxysomes play a pivotal role in lipid conversion to carbohydrates. These specialized peroxisomes are absent in animal cells.Cilia and flagella aid in cell motility. Mainly animal cells have these structures (but not all animal cells). So do some plant cells, too, but they are absent in higher plants.FeaturePlant CellsAnimal CellsCell WallPresent (Cellulose)AbsentChloroplastsPresentAbsentCentriolesGenerally AbsentPresentVacuolesLarge Central VacuoleSmaller Multiple OnesLysosomesRareCommonRibosomesCytoplasmic and ChloroplasticCytoplasmic OnlyCommunication ChannelsPlasmodesmataGap JunctionsGlyoxysomesPresentAbsentIn addition, plant cells often are larger than animal cells. Animal cells (except eggs) range from 10 to 30 micrometers in diameter, while plant cells range from 10 to 100 micrometers in length. Also, plant and animal cells store different energy molecules. Plant cells store starch, while animal cells store glycogen.In conclusion, while plant and animal cells share a foundational cellular structure and machinery, the differences in their organelles and structural components are adaptations to their unique roles in nature. These differences underscore the complexity and adaptability of life at the cellular level.Alberts, B.; Johnson, A.; et al. (2015). Molecular Biology of the Cell (6th ed.). Garland Science. ISBN 978-0815344322.Blair, D.F.; Dutcher, S.K. (October 1992). "Flagella in prokaryotes and lower eukaryotes". Current Opinion in Genetics & Development. 2 (5): 756–767. doi:10.1016/S0959-437X(05)80136-4Campbell, N.A.; Williamson, B.; Heyden, R.J. (2006). Biology: Exploring Life. Boston, Massachusetts: Pearson Prentice Hall. ISBN 978-0132508827.Raven, J.A. (1987). "The role of vacuoles". New Phytologist. 106 (3): 357–422. doi:10.1111/j.1469-8137.1987.tb00149.xRaven, P.H.; Johnson, G.B. (2002). Biology. McGraw-Hill Education. ISBN 978-0071122610.Related Posts Also known as cytology, cell biology is a field of science which helps us to understand how living beings work. Different techniques have been developed to help facilitate our understanding, providing us great insight into how different cells work to fulfill their functions. We don't use this knowledge simply to know what they are, we use it for many practical purposes. This includes the fields of agriculture, disease, biology and many more. A lot of this practical knowledge comes from comparisons between different cells. One of the greatest comparisons is animal cells vs. plant cells.At thedailyECO, we look at the differences between animal and plant cells. We find out their component parts and what are the fundamental differences between these cells which make up living organisms. You can learn more with our definitions and diagrams of plant and animal cells. Contents Before we look at the specific differences between plant and animal cells, we should know more about cells in general. The cell is a morphological and functional unit of all living beings. Cells have the ability to reproduce, grow, metabolize, bind with other cells and pick up signals from the extracellular environment. They are even able to program their own death to make way for new cells.There are two main types of organisms depending on the amount of cells they have:Unicellular: only have one cell and usually are prokaryotes, i.e. they don't have a nucleus.Multicellular: have more than one cell. Eukaryotes are cells with a nucleus and most are of multicellular organisms, although some eukaroytes are unicellular.Unicellular organisms are very small and are mainly protozoa, bacteria and some fungi. Multicellular organisms are more complex. All plants and animals are multicellular.In multicellular organisms, the cells are not individual compartments. In fact, they are able to communicate with each other through signals to coordinate and respond to stimuli from their external environment. Cells are also able to regulate their growth in response to the signals they receive. They are even able to program their own cell death in the face of the accumulation of mutations or failures in their functioning.An example of the importance of these cellular responses is when an organism has cancer. When the cell begins to lose control due to its inability to maintain coordination with its environment, it needs to program its death for the benefit of the larger organism. No study of the cell would have been possible without the technological development and innovation in the optical and electronic field. These innovations have enabled the development of microscopes to observe structures as small as 1 nanometer in size. Now you have some background on cells, we can look at them in more detail. Specifically, we want to make a comparison of plant and animal cells. Below we will look at the differences between plant and animal cells, but first we look at their similarities:One of the main similarities between these two types of cells is that they are the basic morphological and functional units of their respective organisms.Both plant and animal cells are eukaryotic cells. Unlike prokaryotic cells (e.g. bacteria and archaea), animal and plant eukaryotic cells possess an organized cell nucleus with a protective envelope, cell organelles, a cytoskeleton (cell skeleton) and an organized genome encapsulated in chromosomes.They are both surrounded by a semi-permeable plasma membrane which delimits the cytoplasm.Their size oscillates between 10 and 100 µm. Animal cells can reach 30 µm, while plant cells can reach 100 µm (a micron is one thousandth of a millimeter).They both have mitochondria.Given their small size, they cannot be seen with the naked eye, but require a microscope for us to view them.The below diagram of an animal cell and a plant cell will help you understand their similarities. Here you can see the main components (organelle) of both an animal and plant cell.Learn more about how every cell is made up with our article on the definition and functions of cell organelles. Now that you know their similarities, let's see all the differences between an animal and a plant cell:Plant cells possess a cell wall outside the plasma membrane. This wall gives them great rigidity and is made up of cellulose, lignin and other components. Animal cells do not have a cell wall. Some of the plant wall components have multiple commercial and industrial applications.The plant cell contains chloroplasts. These chloroplasts contain pigments such as chlorophyll or carotene and they allow the process of photosynthesis. Many of these pigments have commercial or industrial applications. Animal cells do not have chloroplasts. Learn more with our guide to the different types of chlorophyll.Plant cells have the ability to produce their own food from inorganic components through the phenomenon of photosynthesis, a process called autotrophic feeding.Animal cells do not have the ability to produce their own food from inorganic components, this is called heterotrophic feeding.At the level of photosynthesis, the plant cell is capable of transforming solar or light energy into chemical energy.In animal cells, energy is supplied by the mitochondria.Plant cells have their cytoplasm occupied by large vacuoles which occupy almost 90% of their space. Sometimes they are even a single large vacuole. These vacuoles are used to store metabolic products and eliminate waste products. While animal cells have vacuoles, but they are small in size and they do not occupy so much space.Animal cells have an organelle called a centrosome (responsible for separating chromosomes to divide them into daughter cells), while plant cells do not.Plant cells are generally prismatic in shape, while animal cells can have other different shapes.To summarize all of the above information, we have created a diagram of the differences between an animal and a plant cell below. If you want to read similar articles to The Differences Between Animal and Plant Cells, we recommend you visit our Biology category. The Differences Between Animal and Plant Cells Plant and animal cells are two primary types of eukaryotic cells with key differences. Plant cells have a rigid cell wall made of cellulose, providing structural support, while animal cells lack cell walls, having only a flexible cell membrane. Plant cells contain chloroplasts for photosynthesis, but animal cells do not have chloroplasts and depend on external food sources for energy. Table of ContentBelow are some of the main differences between Plant Cells and Animal Cells: CharacterizationSizeFixed-size, which tends to be bigger. The typical range is between 10 and 100 micrometers.Small and irregular in shape. The range is between 10 and 30 micrometers.ShapeThey have a rigid, fixed shape that is often cubical or rectangular.They are shaped obliquely and spherical.Cell wallPresentAbsentMembraneThe cell membrane is present.The plasma membrane is present.Location of nucleusSide of the wallCenter of the wallMode of nutritionAutotrophicHeterotrophicLocomotion Typically non-motile Some animal cells may have cilia or flagella PlastidsPresentAbsentReproduction Through cell division, spores, and runners Primarily through cell division CentrioleAbsentPresentChlorophyllPresentAbsentNo. of VacuolesContain one large vacuole.Have many vacuoles.Shape of vacuoleLarge in sizeSmall in sizeFood storeAvailable as starchAvailable as glycogen and complex carbsCentrosomesAbsentPresentMicrovilliAbsentPresentMitochondriaPresent in a few numbersPresent in more in number.LysosomesAbsent PresentPlant vs Animal Cells DiagramBelow is the diagrammatic representation of plant and animal cell. What is Plant Cell?A plant cell is a type of eukaryotic cell that is the basic structural and functional unit of plant organisms. It is characterized by a rigid cell wall made of cellulose that provides structural support. It contains chloroplasts, responsible for photosynthesis, converting sunlight into energy. Plant cells typically have a large central vacuole, storing water and maintaining turgor pressure. Their shape is often rectangular or square, and they lack centrioles. These cells work collectively to enable plant growth, nutrient storage, and adaptation to their environment. Plant Cell StructureCharacteristics of Plant CellsPlant cells have several unique characteristics that distinguish them from animal cells. Some of these include: Plant cells have a rigid cell wall made of cellulose.They contain chloroplasts for photosynthesis.Plant cells have a large central vacuole for storage and turgor pressure.They often have a regular or rectangular shape.Besides chloroplasts, they may have other plastids like chromoplasts.Plant cells generally lack centrioles.They are autotrophic, producing their own energy through photosynthesis.They make up various tissues and structures in plants.What is an Animal Cell?An animal cell is a type of eukaryotic cell, forming the basic structural and functional unit of animal organisms. Unlike plant cells, animal cells lack a cell wall and chloroplasts, making them more flexible in shape. They typically have multiple, smaller vacuoles and may possess centrioles involved in cell division. Animal cells obtain energy through external food sources and perform various functions within the complex tissues and organs of animals. The various organelles present in animal cells are Golgi apparatus, smooth endoplasmic reticulum, nuclear envelope, nucleolus, nucleus, cytoplasm, rough endoplasmic reticulum, mitochondria, ribosomes, lysosomes, centriole, plasma membrane, and microvilli are among its components. Animal Cell StructureCharacteristics of Animal CellsPlant cells have several unique characteristics that distinguish them from animal cells. Some of these include: Unlike plant cells, animal cells do not have a rigid cell wall made of cellulose.They lack chloroplasts, which are responsible for photosynthesis in plant cells.Animal cells may have smaller, multiple vacuoles (if present) rather than a large central vacuole.Many animal cells contain centrioles, which play a role in cell division.Animal cells are heterotrophic, relying on external food sources for energy.Animal cells come in diverse and often irregular shapes.They are essential components of complex tissues and organs within multicellular animals.ConclusionAnimal and plant cells are classified as eukaryotic as they possess a true nucleus. Eukaryotes make up the majority of higher animals and plants on Earth, including all plants and animals except bacteria. Both plant and animal cells contain membrane-bound organelles, such as the endoplasmic reticulum, mitochondria, nucleus, Golgi apparatus, and lysosomes. Plant cells are larger in size compared to animal cells. The cell is the basic unit or building block of living organisms. The cell was first observed and discovered under a microscope by Robert Hooke in 1665. The word "cell" came from Latin, which means "small room." The cell membrane encloses the content of the cell and separates all biological activities from the outside world. Tiny structural parts inside the cell, called organelles, are involved in various specialized functions to keep the cell alive and active.[In this figure] Left: The compound microscope used by Robert Hooke to discover "cells." Right: Cell structure of cork illuminated by Robert Hooke in Micrographia, 1665.Definition: What are animals, and what are plants?Animals are multicellular organisms that form the biological kingdom Animalia. They all have characteristics as:Heterotroph – cannot produce its own food. Instead, taking nutrition from other sourcesConsume oxygenAble to moveReproduce sexuallyPlants are multicellular organisms of the kingdom Plantae. Their features include:Autotroph – can produce its own food using light, water, carbon dioxide, or other chemicalsBoth consume and produce oxygenGenerally, do not moveReproduce sexually and asexually[In this figure] Tree of living organisms showing the origins of eukaryotes and prokaryotes.Photo source: wiki.Animal cells vs. Plant cells – key similaritiesAnimal cells and plant cells are eukaryotic cellsBoth animal and plant cells are classified as "Eukaryotic cells," meaning they possess a "true nucleus." Compared to "Prokaryotic cells," such as bacteria or archaea, eukaryotic cells' DNA is enclosed in a membrane-bound nucleus. These membranes are similar to the cell membrane, which is a flexible film of lipid bilayers. Eukaryotes also have several membrane-bound organelles. Organelles are internal structures responsible for various functions, such as energy production and protein synthesis.Both animals and plants are multicellular organismsBased on the current biological classification, both animals and plants are multicellular organisms, meaning that they consist of more than one cell. Different types of cells in a multicellular organism are dedicated to different jobs.For example, cardiac muscle cells pump blood to circulate in the body, while intestinal cells absorb nutrients from the gut lumen into the bloodstream. Many cells assemble into a specific type of "tissue." One or more tissues work together as an "organ." Several organs join forces to carry out a specific physiological task and form a "system."There is a gray zone in the current biological classification called Protista. The Protista, or Protoctista, is a kingdom of simple eukaryotic organisms, usually composed of a single cell or a colony of similar cells. A protist is not an animal, plant, or fungus. However, some protists may behave like animals or plants. For example, protozoans are grouped as animal-like protists, and algae are referred to as mixed groups of plant-like protists. Interestingly, some species confuse scientists by exhibiting characteristics of both animals and plants. The best example is Euglena, a single-celled microorganism that can harvest solar energy by its chloroplasts like a plant, but also swim around using its flagellum like an animal.Animal cell structures[In this figure] Diagram of an animal cell.Plant cell structures[In this figure] Diagram of a plant cell.Cell organelles and their functionsLike different organs within the body, animal and plant cells include various components known as cell organelles that perform different functions to sustain the cells as a whole. These organelles include:Cell featureFunctionMembrane-bound organelle (Yes or No)Present in Animal (A) or Plant (P) cellsNucleusA central place to store the genetic information (genome).YA, PNucleolusA core inside the eukaryotic nucleus where ribosomal RNA is produced.NA, PNuclear envelopeThe membrane separates the nucleus and cytoplasm.YA, PCytoplasmThe part of the cell between the nuclear envelope and plasma membrane.NA, PCytosolGel-like cellular fluid filled up the intracellular space.NA, PCell membraneAlso known as the plasma membrane, a phospholipid bilayer that surrounds the entire cell and encompasses the organelles within.YA, PCell wallProvides structure and protection from the outside environment, only in plants and fungi.NPVacuoleA membrane-bound organelle that contains a mass of fluid and functions as a storage space. A large central vacuole only exists in plant cells.YPChloroplastAn organelle that conducts photosynthesis and produces energy for the plant cells.YPAmyloplastAn organelle that produces and stores starch; commonly found in vegetative plant tissues.YPCytoskeletonA dynamic network responsive for cell movement, division, and intracellular transportationNA, PMitochondrionAlso known as the cell's powerhouse, it is responsible for energy production.YA, PRibosomeThe site for protein synthesis.NA, PEndoplasmic reticulumAn internal membrane that forms branching networks and coordinates protein synthesis.YA, PGolgi apparatusA membrane-bounded organelle dedicated to protein maturation and transportation.YA, PLysosomeAn organelle full of digestive enzymes works like a cell recycling center.YA, PPeroxisomeAn organelle responsible for the fatty acid breakdown and other redox reactions.YA, PAnimal cells vs. Plant cells – major differences[In this figure] The cell anatomy of animal and plant cells.Animal and plant cells share many common organelles, such as a nucleus, ER, cytosol, lysosomes, Golgi apparatus, cell membrane, and ribosomes. The organelles unique to plant cells are the vacuole, cell wall, and chloroplast (shown in orange text).The most striking difference between animal cells and plant cells is that plant cells have three unique organelles: central vacuole, cell wall, and chloroplast. We summarize the major differences between plant and animal cells in this table.CharacteristicsPlant cellsAnimal cellsClassificationEukaryotic cellEukaryotic cellCell sizeUsually larger in sizeSmaller in sizeCell shapeA rectangular fixed shapeA round irregular shapeMovementLimited movementThe cell can move around by changing its shapePlasma membranePresent; don't contain cholesterolPresent; contain cholesterolCell wallComposed of a cell wall made up of celluloseNo cell wallVacuoleHave one large, permanent, central vacuole taking up to 90% of cell volumeOne or more small, temporary vacuoles (much smaller than plant cells)TonoplastTonoplast present around vacuoleAbsentChloroplastContain chloroplasts to perform photosynthesisNo chloroplastPlastidPresent; various typesAbsentNucleusNucleus present along the peripheral of the cellNucleus present at the center of the cellCentriole/ CentrosomeOnly present in lower plant forms (e.g. chlamydomonas)Present in all animal cellsGolgi apparatusHave several simpler GolgiHave a single highly complex GolgiMitochondrionPresentPresentEndoplasmic Reticulum/RibosomePresentPresentLysosomeMaybe present; vacuole also function as a degrading sitePresentPeroxisomePresent; specialized as glyoxysomesPresentPlasmodesmataPresentAbsentFlagellumPresent in some cells (e.g. sperm of bryophytes and pteridophytes, cycads and Ginkgo)Present in some cells (e.g. mammalian sperm cells)CiliaAbsentPresent in some cellsStorageReserve food in the form of starchReserve food in the form of glycogenMitosisSpindle formation is anastral (no aster)Spindle formation is amphiastral (two asters)Energy sourceAutotrophHeterotrophCell WallA difference between plant and animal cells is that plant cells have a rigid cell wall surrounding the cell membrane. Animal cells do not have a cell wall. As a result, most animal cells are round and flexible, whereas most plant cells are rectangular and rigid. When looking under a microscope, the cell wall is an easy feature to distinguish plant cells.[In this figure] Cell wall provides additional protective layers outside the cell membrane.ChloroplastsPlants are autotrophs, meaning they produce energy from sunlight through photosynthesis. This function depends on the organelles called chloroplasts. Animal cells do not have chloroplasts. In animal cells, energy is produced from food (glucose) via a process of cellular respiration. Cellular respiration occurs in mitochondria in both animal and plant cells.[In this figure] The structure of a chloroplast.PlastidsPlastids are double-membrane organelles that are found in the cells of plants and algae. Plastids are responsible for manufacturing and storing food. Plastids often contain pigments used in photosynthesis, and different types of pigments can change the color of the cell. Chloroplasts are the most prominent type of plastids. Other plastids, like chromoplasts, gerontoplasts, and leucoplasts, may only occur in certain plant cells.VacuolesAnimal cells have one or more small vacuoles, whereas plant cells have one large central vacuole that can take up to 90% of the cell volume. The function of vacuoles in plants is to store water and maintain the turgidity of the cell. Sometimes, vacuoles in plants also degrade cellular wastes like lysosomes. A layer of membrane, called tonoplast, surrounds the plant cell's central vacuole. Due to the large size of the central vacuole, it pushes all contents of the cell's cytoplasm and organelles against the cell wall. This may facilitate the cytoplasmic streaming of chloroplasts.[In this figure] Drawing of a plant cell showing a large vacuole.[In this figure] Cytoplasmic streaming in plant cells.Cytoplasmic streaming circulates the chloroplasts around the central vacuoles in plant cells. This optimizes the exposure of light on every single chloroplast evenly, maximizing the efficiency of photosynthesis. The right image is the actual cytoplasmic streaming of chloroplasts in Elodea cells.Created with BioRender.comCentrioleCentrioles are paired barrel-shaped organelles (centrosomes) located in the cytoplasm of animal cells near the nuclear envelope. All animal cells have centrioles, whereas only some lower plant forms have centrioles in their cells (e.g., the male gametes of charophytes, bryophytes, seedless vascular plants, cycads, and ginkgo).[In this figure] Illustration and electron micrography of the centrosome.Left: Centrosomes are composed of two centrioles arranged at right-angles to each other and surrounded by proteins called the pericentriolar material (PCM). Microtubule fibers grow from the PCM. Right: Electron microscopic images of centrioles. (Image: johan-nygren)LysosomeLysosomes are small organelles that work as the recycling center in the cells. They are membrane-bounded spheres full of digesting enzymes. Lysosomes were considered to be exclusive to animal cells. However, this statement became controversial. Plant vacuoles are found to be much more diverse in structure and function than previously thought. Some vacuoles contain their own hydrolytic enzymes and perform the classic lysosomal activity like animals'.PeroxisomePeroxisomes can be found in the cytoplasm of all eukaryotic cells, including both animal and plant cells. In plants, peroxisomes carry out two additional important roles.First, peroxisomes (also called glyoxysomes) in seeds are responsible for converting stored fatty acids to carbohydrates, which is critical to providing energy and raw materials for the growth of the germinating plant. This occurs via a series of reactions termed the glyoxylate cycle.Second, peroxisomes in leaves are involved in carbon recycling from phosphoglycolate (a side product formed during photosynthesis) during photorespiration.[In this figure] Photorespiration involves a complex network of enzyme reactions that exchange metabolites between chloroplasts, leaf peroxisomes, and mitochondria.PlasmodesmataPlasmodesmata are microscopic channels that traverse the cell walls of plant cells and some algal cells, enabling transport and communication between them. Animal cells do not have plasmodesmata but have other ways to communicate between cells, like gap junctions or tunneling nanotubes (TNTs).[In this figure] Plasmodesmata allow molecules to travel between plant cells through the symplastic pathway.Photo source: wiki.Flagella and CiliaTwo cellular structures that allow the movement of animal cells, flagella, and cilia (singular: flagellum and cilium), are absent in plant cells. Sperm cells are an excellent example of animal cells possessing flagella. Sperms use flagella for their movement toward the eggs. Conversely, Cilia act more like short hairs moving back and forth across the outside of the cell.[In this figure] Cellular structures that allow the movement of animal cells: Flagellum (the tail of sperm) and Cilia (the waving hairs on the surface of airway cells).Visual Comparisons – Looking at animal and plant cells under a microscopeYou can easily find samples of animal and plant cells to look at under a microscope. See below to explore more:Cheek cells (specifically, epithelial cells) form a protective barrier lining your mouth. All you need to do is gently scrape the inside of the mouth using a clean, sterile cotton swab and then smear the swab on a microscopic slide to get the cells onto the slide.You can see our step-by-step guide, "Look at your cheek cells."[In this figure] Cheek cells stained with Methylene Blue.The left image is a low magnification. You can see the nuclei stained with a dark blue (because Methylene Blue stains DNA strongly). The cell membrane acts like a balloon and holds all the cell parts inside, such as a nucleus, cytosol, and organelles.The right image is a high magnification. This check cell is about 80 micrometers in diameter. You can also see some small rod-shaped bacteria on the right image. Don't worry; they are normal oral microbes.[In this figure] Microscopic view of onion skin.The onion skin is a layer of protective epidermal cells against viruses and fungi that may harm the sensitive plant tissues. This layer of skin is transparent and easy to peel, making it an ideal subject to study plant cell structure. Without stains, you can only see the cell walls of onion cells. By staining Eosin Y, you can now see a nucleus inside an onion cell.You can follow our step-by-step guide, "Look at the Plant Cells" to prepare your own onion skin slide.Q&A: Frequently asked questions are quickly answered hereWhat do plant cells have, but animal cells do not?In brief, the most striking difference between animal cells and plant cells is that plant cells have three unique organelles: the central vacuole, the cell wall, and the chloroplast.What do animal cells have that plant cells do not?Animal cells have centrioles/centrosomes that most plant cells don't. Some animal cells also have flagella and cilia, which are absent in plant cells.What does a plant cell look like?Due to the cell wall, many plant cells have a fixed rectangular shape.[in this figure] The illustration of the cell wall.The cell wall acts like a cardboard box that protects the soft cell membrane and cytoplasm. Like real cardboard boxes can be piled up to build a tall wall, the plant grows by adding cells one by one as living building blocks. The weight is loaded primarily on the structural cell walls.Do plant cells have cell membranes?Yes, plant cells have a cell membrane layer underneath the cell wall. The cell membrane detaches from the cell wall under a hypertonic condition.[In this figure] Turgor pressure on plant cells diagram.Photo source: wiki.Do plant cells have mitochondria?Yes, both animal and plant cells have mitochondria, but only plant cells have chloroplasts. In plant cells, chloroplasts absorb energy from sunlight and store it in the form of sugar (a process called photosynthesis). In contrast, mitochondria use chemical energy stored in sugars as fuel to generate ATP (called cellular respiration). Like animal cells, plant cells use ATP to drive other cellular activities.[In this figure] The carbon cycle shows how energy flows between chloroplasts and mitochondria to benefit the ecosystem.Do animal cells have a cell wall?No, animal cells do not have a cell wall so they can freely change their cell shapes.Do plant cells have centrioles?No, plant cells do not have centrioles for mitosis except for some lower plant forms.Do plants have lysosomes?The presence of lysosomes in plant cells is under debate. Vacuoles in plant cells can fulfill the role of animal lysosomes.Do plant cells have ribosomes?Yes, plant cells have both free and endoplasmic reticulum-bound ribosomes for protein synthesis.What do all cells have in common?All cells (prokaryotic or eukaryotic; animal or plant) share four common components:Plasma membrane, an outer covering that separates the cell's interior from its surrounding environment.Cytoplasm, consisting of a jelly-like region within the cell in which other cellular components are found.DNA, the genetic material of the cell.Ribosomes, particles that synthesize proteins.All cells on Earth have similar chemical compositions and meet the description of cell theory. The central dogma of molecular biology as "DNA makes RNA, and RNA makes protein" is also true in all cells.Are plants eukaryotic?Yes, both plants and animals are eukaryotes and have membrane-bound nuclei and organelles. Prokaryotic cells are bacteria and archaea.Do animal cells have chloroplasts?No, animals do not have chloroplasts, so they can not produce their food. However, some animals may borrow chloroplasts and live like a plant. Elysia chlorotica (common name the eastern emerald elysia) is one of the "solar-powered sea slugs," utilizing solar energy to generate energy. The sea slug eats and steals chloroplasts from the alga Vaucheria litorea. The sea slugs then incorporate the chloroplasts into their own digestive cells, where the chloroplasts continue to photosynthesize for up to nine months.[In this figure] Elysia cholorotica, a sea slug found off the U.S. East Coast, can steal photosynthetic chloroplasts from algae.Photo source: Mary S. Tyler/PNASDo plant cells have cytoskeleton?Yes, both plant and animal cells have a similar cytoskeleton. Constrained by the cell wall, the plant cell's cytoskeleton does not allow a dramatic change in the cell shape. However, the cytoskeleton network of actin filaments, microtubules, and intermediate filaments generate shape, structure, and organization to the cytoplasm of the plant cell. The cytoskeleton also drives the cytoplasmic streaming in plant cells.How does cytokinesis differ in plant and animal cells?Cytokinesis occurs in mitosis and meiosis in both plants and animals to separate the parent cell from daughter cells.In plants, cytokinesis occurs when a cell wall forms between the daughter cells. In animals, cytokinesis occurs when a cleavage furrow forms. This pinches the cell in half.[In this figure] The difference of cytokinesis in plant and animal cells. Fact Checked Content Last Updated: 01.12.2023 12 min reading time Content creation process designed by Content cross-checked by Content quality checked by Save Article Save Article Together with fungal and protozoan cells, animal and plant cells are the main types of Eukaryotic Cells that exist. Even though plant and animal cells have several aspects in common, there are key structural differences that make them behave differently, as we will see later in the article.The following table details the presence or absence of different important organelles and other key structures in animal and plant cells:OrganellePlant CellAnimal CellPlasma MembraneYesYesCell wallYes, made of cellulose*NoNucleus and nucleolusYesYesRough and smooth endoplasmic reticulum (ER)YesYesGolgi apparatusYesYesPlastids*YesNoMitochondriaYesYesRibosomesYesYesCytoskeletonYes, but lack centrioles and centrosomesYesPeroxisomes and lysosomesYesYesAmylopastsYesNoLysosomesNoYesPeroxisomesYesYesVacuole(s)Yes - one large vacuole that occupies most of the cytoplasmYes - several small and dynamic vacuoles that do not occupy too much space within the cellTable 1. Organelles and cell structures present in animal and plant cells.Cellulose is a long-chain molecule made up of glucose units.Plastids: plastids are organelles that contain pigment and perform Photosynthesis. Chloroplasts are plastids that contain chlorophyll, which absorbs light energy from the sun and uses it to convert carbon dioxide into organic matter such as glucose.Amyloplasts are colourless vesicle-like organelles which store starch.Lysosomes are a type of membrane-bound organelle which contain hydrolytic Enzymes capable of breaking down complex molecules like Proteins or Carbohydrates, and are only present in animal cells. Peroxisomes might look similar under the microscope, but they contain Enzymes that help cells neutralise and protect themselves from reactive oxygen species, and are present in plant and animal cells.Let's take a closer look at the structures of plant and animal cells. Can you tell how to distinguish both types of cell by looking at the diagram below?Fig. 1. Differences and similarities between plant and animal cells. Remember that ER is the abbreviation for endoplasmic reticulum. As you can see from the diagram, plant and animal cells look very different. Thus, there are simple ways to distinguish both of them:The shape of the cell: plant cells are usually square or rectangular due to the cell wall, but animal cells can vary significantly in shape because they aren't constrained by the rigid cell wall.A lack of a cell wall marks the eukaryotic cell as an animal cell. Not having a cell wall means that animal cells can change shape to adapt to the amount of water exiting or entering the cell, with the risk of bursting or lysing. However, plant cells cannot do this to the same degree. Plant cells have two statuses depending on the amount of water they contain:Turgid: When a plant cell is fully hydrated and contains an excess of water, it becomes turgid and the cell wall prevents further uptake of water. This results in increased pressure within the cell and the cell becomes firm and rigid.Flaccid: When a plant cell loses water, it becomes flaccid. The reduction in pressure within the cell causes the cell wall to collapse and the cell to become limp. This process is called plasmolysis. This status can be reversed by watering a plant.Fig. 2. Turgid, flaccid and plasmolysed plant cells. Plant cells can transition through these stages depending on the amount of water they can absorb.The presence of a big vacuole indicates that the cell is a plant cell. Animal cells do not have a big, permanent vacuole because they do not have cell sap. The permanent vacuole is the largest organelle found in plant cells, whilst in animal cells, the largest organelle is usually the cell nucleus.Animal cells do not have chloroplasts. Chloroplasts contain chlorophyll for Photosynthesis. You may recall that photosynthesis is the process by which Plants use light energy to form valuable products such as sugars. Animal cells do not photosynthesise and so do not need chloroplasts. Chlorophyll is a pigment which gives plant leaves their characteristic green colour. When looking through a microscope, what cell are you looking at?We must be able to tell the difference between plant and animal cells. One simple way we can do this is by looking for the presence of a vacuole. When looking through a microscope or at an image of a cell, this will appear as a large space taking up most of the cell. If we can see this, then it must be a plant cell.Remember that plant cells also have a cell wall; this may appear rigid when compared to the cell membrane of an animal cell. However, the presence of a cell wall does not exclude fungal cells or prokaryotic cells if these are options!Fig. 3. Example of a plant cell sample under the microscope. The green dots in the image are chloroplasts. Depending on the type of sample preparation, you might be able to see the chloroplasts, the vacuole, the cell wall, or all of these characteristics of plant cells. Source: Flickr. If looking at an image in colour, chloroplasts may also be present in a plant cell. Animal cells do not carry out photosynthesis and so do not have chloroplasts. These will appear green on an image.It's common for schools to ask students to label a plant and/or animal cell diagram. Each cell has it's peculiarities as we have seen above, but the organelles and other cell structures have such peculiar shapes that you'll be sure to identify each one quickly once you've tried once or twice.As you can see, a labeled diagram of a plant cell typically includes the following structures: cell wall, cell membrane, nucleus, cytoplasm, chloroplasts, mitochondria, endoplasmic reticulum, Golgi apparatus, peroxisomes, and a central vacuole.Fig. 4. Labelled plant cell diagram. Take note of the shape and location of each organelle and the shape of the cell.From the diagram below, you can see that a labeled diagram of an animal cell typically includes the following structures: cell membrane, nucleus, cytoplasm, mitochondria, endoplasmic reticulum, Golgi apparatus, lysosomes, centrosomes, and Cytoskeleton.Fig. 5. Labelled animal cell diagram. Take note of the shape and location of each organelle and the shape of the cell.Drawing plant and animal cells When learning how to draw animal and plant cells, you can follow these steps to ensure you understand the various cells! Start by trying to label diagrams of already-drawn plant and animal cells.Make two lists. One list of all the organelles found in plant cells and one list of the organelles found in animal cells.Remember to include the organelles found in plant cells that are not in animal cells.Now, try to draw both an animal cell and a plant cell adding all the relevant organelles. Animal and plant cells are often similar, although some plant cells can be twice or three times larger than some animal cells. Bear this in mind when drawing your plant and animal cells! Look at all the diagrams in this article to help with the drawing.Another way to test your knowledge on animal and plant cells is to take a pre-drawn empty diagram of each type of cell and label the organelles that appear in both. You can start with the ones in these diagrams:No cheating! Try to fill out the diagram without looking at the labelled diagrams above.Fig.6. Can you remember which type of cell this is, and what organelles the arrows are pointing at?Fig. 7. Can you remember which type of cell this is, and what organelles the arrows are pointing at?Plant and animal cells have a few similarities, starting with the fact that they are both eukaryotic cells. This means that they both have a nucleus containing the Genetic Information in the form of DNA, and membrane-bound organelles. As we have seen in this article, though, the type and number of organelles can significantly differ between animal and plant cells.However, as any cell, plant and animal cells tick all the boxes that characterise the basic unit of life:Both cell types can reproduce independently via Mitosis and Cytokinesis. Plant cells need to generate new cell wall apart from Plasma Membrane, though.Both plant and animal cells respire, i.e. they have catabolic reactions as part of their metabolism. On top of that, most plant cells also photosynthesise.Plant and animal cells respond to stimuli, can grow and move, although plant's movement is extremely limited.Both plant and animal cells depend and interact with their environment.Both animal and plant cells are surrounded by a cell membrane, a thin layer that helps protect the cell and regulate what goes in and out. This means that their nucleus is membrane-bound. Animal and plant cells create incredibly different organisms, with different characteristics, requirements and abilities. This difference already starts at the cellular level, in particular, it starts at the level of Cell Structure, which we have already covered. The structural differences like the presence of a cell wall in plant cells, or of centrioles in animal cells then end up giving the different functionalities of each cell type.Remember: structure always conditions function!Other differences between plant and animal cells include motility, Cell Division, photosynthesis capacity and shape.Motility: animal cells can move around, slide and bend, whereas plant cells are stationary relative to each other and can't migrate. However, Plants can orientate and bend towards a nutrient source, like a humid plot of land or the rays of the sun. The differences in motility will influence the way each cell type reacts to the environment.Cell Division: although both animal and plant cells divide through Mitosis and Cytokinesis, the specific steps for each cell type are different. For example, plant cells need to generate new cell wall to create two daughter cells, while animal cells only have to split the plasma memebrane to prodiuce to daughter cells. Animal cells have centrioles which play a key role in cell division, while plant cells do not have them. In the end, these differences translate into a speedier division for animal cells in general, although we should be careful of making general statements like this as many factors can influence the speed of cell division.Photosynthesis: plants have chloroplasts, which allow them to transform sunlight and other inorganic matter into organic matter (glucose) and oxygen. This is why plants are considered "producers" in an ecosystem, because they can create their own "food" from inorganic molecules and light. Other organisms, those that have animal cells among others, can't create their own organic matter and need to consume plants to obtain nutrients and energy.Shape: due to the lack of cell wall, animal cells have more irregular shapes compared to plant cells.Remember that plant cells contain a permanent vacuole or cell wall, while animal cells do not!Animal cells and plant cells are eukaryotic cells with more similarities than differences in their structure.Differences in animal and plant Cell Structure include the presence of a cell wall, chloroplasts, and a big vacuole in plant cells; and centrosomes and centrioles plus smaller vacuoles in animal cells.Similarities between plant and animal cells include the characteristics of the basic unit of life: reproduce independently, metabolism, motility, response to the environment, growth and interaction with the environment.Differences apart from cell structure include a varying degree of motility, the ability of plant cells to photosynthesise, a different process and speed of cell division, and different shape. How many cells do plants and animals have? Animals and plants have millions of cells. Humans, for example, have 40 trillion on average, and as old ones die, new ones reproduce, with us barely noticing. What is the difference between plant and animal cells? Plant cells contain a vacuole, chloroplasts and a cell wall. Animal cells do not have these organelles, but have centrioles, lysosomes and centrosomes. What are 3 unique things about plant cells? Plant cells have a cell wall made of cellulose, a big vacuole which takes up most of the cell's cytoplasm, and chloroplasts, which allow plants to photosynthesise. Do animal cells have a cell wall? Animal cells do not have a cell wall. What do animal cells have that plant cells don't? Animal cells have centrosomes and lysosomes, whilst plants do not. Centrosomes are involved in mitosis, and lysosomes are involved in breaking down complex molecules. What is another name for animal and plant cells? Another name for animal and plant cells is eukaryotic cells. Both animal and plant cells are part of the eukaryotic cell group. Save Article At StudySmarter, we have created a learning platform that serves millions of students. Meet the people who work hard to deliver fact based content as well as making sure it is verified. Lily Hulatt is a Digital Content Specialist with over three years of experience in content strategy and curriculum design. She gained her PhD in English Literature from Durham University in 2022, taught in Durham University's English Studies Department, and has contributed to a number of publications. Lily specialises in English Literature, English Language, History, and Philosophy. Get to know Lily Gabriel Freitas is an AI Engineer with a solid experience in software development, machine learning algorithms, and generative AI, including large language models' (LLMs) applications. Graduated in Electrical Engineering at the University of São Paulo, he is currently pursuing an MSc in Computer Engineering at the University of Campinas, specializing in machine learning topics. Gabriel has a strong background in software engineering and has worked on projects involving computer vision, embedded AI, and LLM applications. Get to know Gabriel StudySmarter is a globally recognized educational technology company, offering a holistic learning platform designed for students of all ages and educational levels. Our platform provides learning support for a wide range of subjects, including STEM, Social Sciences, and Languages and also helps students to successfully master various tests and exams worldwide, such as GCSE, A Level, SAT, ACT, Abitur, and more. We offer an extensive library of learning materials, including interactive flashcards, comprehensive textbook solutions, and detailed explanations. The cutting-edge technology and tools we provide help students create their own learning materials. StudySmarter's content is not only expert-verified but also regularly updated to ensure accuracy and relevance. Learn more Hey Science Teachers! We've created a new and free set of printables for you and your students. It contains a total of 12 pages what includes two amazing crafts for Primary kids. If you want to download the whole pack in a high quality PDF file, you just need to scroll down until the end of this post. What is an animal cell? An animal cell is an eukaryotic cell that appears in the living organisms that belong to the Animal Kingdom. They do not have a cell wall in the outside and they are heterotrophic what means they cannot create their own nutrients. Other characteristics are: they do not have chloroplasts and they have smaller vacuoles than plant cells. What is a plant cell? A plant cell is an eukaryotic cell that appears in the living organisms that belong to the Plant Kingdom. They are formed by cell walls and a cytoplasmic membrane (also known as plasma membrane). The cell wall is what gives them the strength and rigidity. The chloroplasts are an essential part for the photosynthesis process. Appart from theory and activities worksheets , we've prepared two amazing crafts that your pupils will love. Here you have an example of how the crafts are when they are finished. We highly recommend you to color them to make them prettier. Download the PDF file here Download Animal and Plant cell