DOWNLOAD PDF ECOLOGICAL MORPHOLOGY AND ANATOMY

Chapter 1 : Morphology (biology) - Wikipedia

Ecological morphology examines the relation between an animal's anatomy and physiologyâ€"its form and functionâ€"and how the animal has evolved in and can inhabit a particular environment.

Morphology refers to the size, shape, and arrangement of cells. The observation of microbial cells requires not only the use of microscopes but also the preparation of the cells in a manner appropriate for the particular kind of microscopy. During the first decades ofâ€¦ Historical background Evidence that prehistoric humans appreciated the form and structure of their contemporary animals has survived in the form of paintings on the walls of caves in France, Spain, and elsewhere. During the early civilizations of China, Egypt, and the Middle East , as humans learned to domesticate certain animals and to cultivate many fruits and grains, they also acquired knowledge about the structures of various plants and animals. Aristotle was interested in biological form and structure, and his Historia animalium contains excellent descriptions, clearly recognizable in extant species , of the animals of Greece and Asia Minor. He was also interested in developmental morphology and studied the development of chicks before hatching and the breeding methods of sharks and bees. Galen was among the first to dissect animals and to make careful records of his observations of internal structures. His descriptions of the human body , though they remained the unquestioned authority for more than 1, years, contained some remarkable errors, for they were based on dissections of pigs and monkeys rather than of humans. In an Italian physiologist, Marcello Malpighi , the founder of microscopic anatomy, demonstrated the presence of the small blood vessels called capillaries , which connect arteries and veins. The existence of capillaries had been postulated 30 years earlier by English physician William Harvey , whose classic experiments on the direction of blood flow in arteries and veins indicated that minute connections must exist between them. Between and , Dutch microscopist Antonie van Leeuwenhoek used the recently invented microscope to describe red blood cells , human sperm cells, bacteria , protozoans , and various other structures. Cellular componentsâ€"the nucleus and nucleolus of plant cells and the chromosomes within the nucleusâ€"and the complex sequence of nuclear events mitosis that occur during cell division were described by various scientists throughout the 19th century. Organographie der Pflanzen â€"; Organography of Plants, â€"05 , the great work of a German botanist, Karl von Goebel , who was associated with morphology in all its aspects, remains a classic in the field. British surgeon John Hunter and French zoologist Georges Cuvier were early 19th-century pioneers in the study of similar structures in different animalsâ€"i. Cuvier in particular was among the first to study the structures of both fossils and living organisms and is credited with founding the science of paleontology. A British biologist, Sir Richard Owen , developed two concepts of basic importance in comparative morphologyâ€"homology, which refers to intrinsic structural similarity, and analogy , which refers to superficial functional similarity. One of the major thrusts in contemporary morphology has been the elucidation of the molecular basis of cellular structure. Techniques such as electron microscopy have revealed the complex details of cell structure, provided a basis for relating structural details to the particular functions of the cell, and shown that certain cellular components occur in a variety of tissues. Studies of the smallest components of cells have clarified the structural basis not only for the contraction of muscle cells but also for the motility of the tail of the sperm cell and the hairlike projections cilia and flagella found on protozoans and other cells. Studies involving the structural details of plant cells, although begun somewhat later than those concerned with animal cells, have revealed fascinating facts about such important structures as the chloroplasts , which contain chlorophyll that functions in photosynthesis. Attention has also been focused on the plant tissues composed of cells that retain their power to divide meristems , particularly at the tips of stems, and their relationship with the new parts to which they give rise. The structural details of bacteria and blue-green algae , which are similar to each other in many respects but markedly different from both higher plants and animals, have been studied in an attempt to determine their origin. Morphology continues to be of importance in taxonomy because morphological features characteristic of a particular species are used to identify it. As biologists have begun to devote more attention to ecology , the identification of plant and animal species present in an area and perhaps changing in numbers in response to environmental changes has become increasingly significant. Fundamental concepts Homology and analogy Homologous structures develop from similar embryonic substances and thus have similar basic structural and developmental patterns, reflecting common genetic endowments and evolutionary relationships. In marked contrast, analogous structures are superficially similar and serve similar functions but have quite different structural and developmental patterns. The arm of a human, the wing of a bird, and the pectoral fins of a whale are homologous structures in that all have similar patterns of bones, muscles, nerves, and blood vessels and similar embryonic origins; each, however, has a different function. The wings of birds and those of butterflies, in contrast, are analogous structuresâ€"i. Although such structures serve similar functions, they have quite different evolutionary origins and developmental patterns. The terms homology and analogy are also applied to the molecular structures of cellular constituents. Because the hemoglobin molecules from different vertebrate species contain remarkably similar sequences of amino acids , they may be termed homologous molecules. In contrast, hemoglobin and hemocyanin, the latter of which is present in crab blood, are described as analogous molecules because they have a similar function oxygen transport but differ considerably in molecular structure. Corresponding similarities occur in the structures of other proteins from different speciesâ€"e. Body plan and symmetry The bodies of most animals and plants are organized according to one of three types of symmetry: A spherically symmetrical body is similar throughout and can be cut in any plane through the centre to yield two equal halves. A few of the simplest plants and animals are spherically symmetricalâ€"e. Radially symmetrical bodies, such as those of starfishes and mushrooms, have a distinguishable top and bottom and usually have a cylindrical shape, with the body parts radiating from the central axis. A starfish can be cut into two equal halves by any plane that includes the line, or axis, running through its centre from top to bottom. The anterior, or oral, end usually contains the mouth; a posterior, or aboral, end may have an anus. In the bilaterally symmetrical body of higher animals including humans, only a cut from head to foot exactly in the centre divides the body into equivalent halves. An anterior, or head, end and a posterior, or tail, end can be distinguished; and the dorsal, or back, side can be distinguished from the ventral, or belly, side. But because some internal organs of humans are not symmetrical e. A few organismsâ€"amoebas, slime molds, and certain spongesâ€"with an irregular form, or one that changes as the organism moves, have no plane of symmetry. Morphological basis of classification The features that distinguish closely related species of plants and animals are usually superficial differences such as colour, size, and proportion. In contrast, the major divisions, or phyla, of the plant and animal kingdoms are distinguished by characteristics that, though usually not unique to a single division or phylum, occur in unique combinations in each. One morphological feature useful in classifying animals and in determining their evolutionary relationships is the presence or absence of cellular differentiationâ€"i. Some multicellular animals have only two embryonic cell, or germ , layers: Other animals have these, in addition to a mesoderm , which lies between the ectoderm and endoderm. Animals may have one of two types of body cavity. The bodies of the Coelenterata invertebrates such as the jellyfish and other primitive many-celled animals consist of a double-walled sac surrounding a single cavity with a mouth. Higher animals have two cavities, and their bodies are constructed on a so-called tube-within-a-tube plan. An inner tube, or digestive tract, is lined with endoderm and opens at each end to form the mouth and the anus. An outer tube, or body wall, is covered with ectoderm. Between the two tubes a second cavity, or coelom, lies within the mesoderm and is lined by it. Another major distinguishing morphological feature of animal phyla is the presence or absence of segmentation. The members of several phyla have bodies characterized by the presence of a row of segments, or body units, of the same fundamental structure. Segmented animals include the vertebrates, the annelids invertebrates such as the earthworm , and the arthropods invertebrates such as insects ; in some segmented animals such as humans and most vertebrates, however, the segmental character of the body is obscured. An evolutionary tendency in many animal phyla has been the progressive differentiation of the anterior end to form a head with conspicuous sense organs and an accumulation of nervous tissues, a brain ; the tendency is called cephalization. Some morphological structures are found only in one phylum; for example, only the Coelenterata have stinging cells nematocysts , the Echinodermata invertebrates such as starfishes have a peculiar water vascular system , and only the Chordates e. Like animals, plants may be either single-celled or composed of many kinds of specialized cells. The bodies of most of the lower plants, such as algae and fungi, comprise the least-differentiated and least-specialized type of plant cells, parenchyma cells. The embryonic tissues of higher plants, unlike those of animals, remain extremely active throughout the life of the plant. In addition, the different types of cells characteristic of the body of higher plants arise from meristems, specific regions in the plant body where cells divide and enlarge. In all but the simplest forms, the plant body is composed of various types of cells associated in more or less definite ways to form systems of units called tissue systemsâ€”e. The arrangement of the components of the vascular system is a distinguishing morphological feature of various plant groups. The character and relative extent of the two phases in the life history of a plantâ€”the sexual phase, or gametophyte , and the sporophyte â€”vary considerably among the plant groups and are useful in distinguishing them. Areas of study Anatomy The best known aspect of morphology, usually called anatomy, is the study of gross structure, or form, of organs and organisms. It should not be inferred however, that even the human body, which has been extensively studied, has been so completely explored that nothing remains to be discovered. It was found only in , for example, that the nerve to the pineal gland , which lies on the upper surface of the brain of mammals, is a branch from the sympathetic nerves; the sympathetic nerves receive nerve impulses from a small branch of the nerves that transmit impulses from the eye to the brain optic nerves. Thus the pineal gland responds by a very indirect route to quantitative changes in the environmental lighting and secretes appropriate amounts of the substance it forms, the hormone melatonin. Detailed comparisons of the morphological features of different animals, called comparative anatomy , provide strong arguments for the evolutionary relationships among different species. In the course of evolution , animals and plants tend to undergo adaptive morphological changes that enable them to survive under certain environmental conditions. As a result, animals only remotely related evolutionarily may come to resemble each other superficially because of common adaptations to similar environments , a phenomenon known as convergent evolution. Structural similaritiesâ€”streamlined shape, dorsal fins, tail fins, and flipper-like forelimbs and hindlimbs, for exampleâ€”have evolved in such varied animal groups as the dolphins and porpoises, both of which are mammals ; the extinct ichthyosaurs, which were reptiles; and both the bony and cartilaginous fishes. In a like manner, the mole, an insectivore, and the gopher, a rodent, have both evolved shovellike forelimbs, an adaptation for digging. An opposite phenomenon, divergent evolution, occurs when animals originally closely related adapt to different environments and come to be superficially quite different. Although sea lions and seals, for example, are carnivores and thus closely related to bears, cats, and dogs, their adaptations to an aquatic existence have resulted in morphological characteristics distinct from those of the terrestrial carnivores. In the course of mammalian evolution, many features have changed to permit specific animal groups to adapt to particular environmentsâ€”e. Careful study of adaptive morphological aspects has permitted inferences about the course of the evolutionary history of various animals and of their successive adaptations to changing environments. The present-day Australian tree-climbing kangaroos , for example, are the descendents of a ground-dwelling marsupial , from whom evolved forms that began to live in trees and eventually developed limbs adapted to tree climbing. But the events may have occurred in the reverse sequence; that is, specialized limbs may have evolved before the animal adopted an arboreal mode of life. In any event, some of the tree-dwelling kangaroos subsequently left the trees, became readapted to life on the ground i. Careful comparisons of the feet of the many kinds of living Australian marsupials reveal the stages in this complicated process of adaptation and re-adaptation. Changes in genes mutations constantly occur and may cause a decrease in size and function of an organ. On the other hand, a change in the environment or in the mode of life of a species may make an organ unnecessary for survival. As a result, many plants and animals contain organs or parts of organs that are useless, degenerate, undersized, or lacking some essential part when compared with homologous structures in related organisms. The human body, for instance, has more than such organsâ€”e. The parts of a seed plant include roots, stems, leaves, and reproductive organs in the flowers. The evolution of specialized conducting tissues called xylem and phloem has enabled seed plants to survive on land and to attain large sizes. Roots anchor the plant, enable it to maintain an upright position, and absorb water, minerals, and other nutrients from the soil. The roots of plants such as carrots, beets, and yams serve as sites for food storage. The stem links the roots with the leaves, where photosynthesis occurs, and its xylem and phloem are continuous with those of root and leaf. The stem supports leaves, flowers, and fruits. Each year, the stems of woody plants add a layer of xylem and phloem, the annual ring , the width of which varies with climatic conditions. A leaf consists of a petiole stalk , by which it is attached to the stem, and a blade, typically broad and flat, that contains bundles, or veins, of xylem and phloem on the undersurface. The flower contains pollen -producing anthers and egg-producing ovules. After fertilization the base of the flower, or ovary , enlarges and forms the fruit, which is a mature ovary containing seeds, or mature ovules. The bodies of ferns and mosses also are composed of roots, stems, and leaves, but those of lower plants such as mushrooms and kelps are much more simple and lack true roots, stems, and leaves. Histology A major trend in the evolution of both plants and animals has resulted in the specialization of cells and a division of labour among them.

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Chapter 2 : morphology | Definition & Examples | www.nxgvision.com

It also discusses nematode morphology, anatomy, taxonomy, and ecology, including the origin of plant nematodes and population dynamics. It features drawing examples of free-living and animal parasitic nematodes.

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Chapter 3 : Ecological Morphology: Integrative Organismal Biology, Wainwright, Reilly

â€¢ Anatomy is a subdivision of morphology, whereas morphology is a branch of biology. â€¢ External features such as gross size, shape, colour, and other physical features of the biological structures are studied in morphology while anatomy is concerned about the cellular and tissue level composition of the biological structures.

Submit manuscript at https: Priority will be given to the studies that clearly articulate their relevance to the anatomical community. Focal areas of the journal include: Manuscripts with novel methods or synthetic perspective on the anatomical system, studies that describes anatomy are welcome, if they communicate clearly on the broader functional or evolutionary significance. Articles covering bioinformatics and the functional anatomical understanding will also be considered. The Journal also publishes original research articles on macroscopic anatomy , histological development , Morphological Sciences , Cell and Molecular Biology , Macroscopic Human Anatomy , and Microscopic Human Anatomy. Morphology Applied to other Sciences like phonology, syntax, and semantics , the acquisition and processing of morphological information , mental lexicon, and morphological variation and change, models of morphology, morphological typology, the position of morphology in the architecture of the human language, and the evolution of language. The Journal accepts original manuscripts in the form of research article, review article, short communication, case report, letter-to-the-Editor and Editorials for publication. All the published articles are open access and can be accessed online without any subscription charges. The journal extensively enhances the worldwide visibility of the scholars that contribute their research work. The Editorial Manager System helps in maintaining the quality of the peer review process and enables the authors to track the review and publication process in an automated way. Experts in the field of Morphology and Anatomy take up the review process under the guidance of Editor-in-Chief. Approval of at least two independent reviewers and the editor is mandatory for the acceptance of the manuscript for publication. Anatomical Sciences Anatomy is the identification and description of the structures of living things. Anatomy is a branch of biology and medicine which can be divided into three broad areas: Anatomy is inherently tied to embryology, Comparative anatomy, Evolutionary biology, phylogeny, as these are the processes by which anatomy is generated over immediate embryology and long evolution timescales. Comparative Embryology Embryology is the branch of biology that is concerned with the development of gametes sex cells , fertilization, and development of embryos and fetuses. It is the science dealing with the formation, development, structure, and functional activities of embryos. Embryology is the study of congenital disorders that occur before birth. Comparative embryology is the branch of embryology that compares and contrasts embryos of different species. It is used to show how all animals are related. Many things are compared such as whether or not the organism has a notochord or gill arches. Many components go into comparative embryology, and much information about the developmental similarities between species can be taken from its study, from which many conclusions can be drawn. General Anatomy General Anatomy or Comparative anatomy is the study of similarities and differences in the anatomy of different species. Two major concepts of comparative anatomy are: They may or may not serve the same function. An example is the forelimb structure shared by cats and whales. They usually perform the same or similar purposes. An example is the streamlined torpedo body shape of porpoises and sharks. So even though they evolved from different ancestors, porpoises and sharks developed analogous structures as a result of their evolution in the same aquatic environment. It addresses the origin and evolution of embryonic development; how modifications of development and developmental processes lead to the production of novel features, such as the evolution of feathers, the role of developmental plasticity in evolution; how ecology impacts development and evolutionary change; and the developmental basis of homoplasy and homology. Phylogenetic Tree A phylogenetic tree or evolutionary tree is a branching diagram that shows the inferred evolutionary relationships among various biological species or other entities-their phylogeny-based upon similarities and differences in their physical or genetic characteristics. A phylogenetic tree, also known as a phylogeny, is a diagram that depicts the lines of evolutionary descent of different species, organisms, or genes from a common ancestor. Phylogenies are useful for organizing knowledge of biological diversity, for structuring classifications, and for providing insight into events that occurred during evolution. Furthermore, because these trees show descent from a common ancestor, and because much of the strongest evidence for evolution comes in the form of common ancestry, one must understand phylogenies in order to fully appreciate the overwhelming evidence supporting the theory of evolution. Surface Anatomy Surface anatomy also known as superficial anatomy and visual anatomy is the study of the external features of the body. It deals with anatomical features that can be studied by sight, without dissection. It is a branch of gross anatomy, along with endoscopic and radiological anatomy. Surface anatomy is a descriptive science. In particular, in the case of human surface anatomy, these are the form and proportions of the human body and the surface landmarks which correspond to deeper structures hidden from view, both in static pose and in motion. Macroscopic Anatomy It is the study of the structure of the body and its parts without the use of a microscope. There are many ways to approach gross anatomy: Many advanced courses in anatomy stress a regional approach, because it emphasizes the spatial relationships between structures already familiar to students. Organ systems are groups of organs that function together in a coordinated manner. For example, the heart, blood, and blood vessels form the cardiovascular system, which distributes oxygen and nutrients throughout the body. Introductory texts present systemic anatomy because that approach clarifies functional relationships among the component organs. The human body has 11 organ systems, and we will introduce them later in the chapter. Because developmental anatomy considers anatomical structures over such a broad range of sizes from a single cell to an adult human , techniques used in it are similar to those used in both microscopic anatomy and gross anatomy. The most extensive structural changes occur during the first 2 months of development. Microscopic Anatomy The study of the structure of cells, tissues, and organs of the body as seen with a microscope. Microscopic anatomy deals with structures that cannot be seen without magnification. The boundaries of microscopic anatomy are established by the limits of the equipment used. With a light microscope, you can see basic details of cell structure; with an electron microscope, you can see individual molecules that are only a few nanometers across. Tissue Sciences A tissue is one of the building blocks of an organism--either animal or plant. An organism is comprised of tissues, which are made up of individual cells. The study of tissues is a field known as histology. Histology is the study of the microscopic anatomy microanatomy of cells and tissues of plants and animals. It is commonly performed by examining cells and tissues under a light microscope or electron microscope, the specimen having been sectioned cut into a thin cross section with a microtome , stained, and mounted on a microscope slide. Histological studies may be conducted using tissue culture, where live human or animal cells are isolated and maintained in an artificial environment for various research projects. The ability to visualize or differentially identify microscopic structures is frequently enhanced through the use of histological stains. Histology is an essential tool of biology and medicine. Morphological Sciences Morphology is a branch of biology dealing with the study of the form and structure of organisms and their specific structural features. This includes aspects of the outward appearance shape, structure, colour, pattern, size , i. Vertebrate Anatomy All vertebrates have a similar basic body plan and at some point in their lives, mostly in the embryonic stage , share the major chordate characteristics; a stiffening rod, the notochord; a dorsal hollow tube of nervous material, the neural tube; pharyngeal arches; and a tail posterior to the anus. The spinal cord is protected by the vertebral column and is above the notochord and the gastrointestinal tract is below it. Nervous tissue is derived from the ectoderm, connective tissues are derived from mesoderm, and gut is derived from the endoderm. At the posterior end is a tail which continues the spinal cord and vertebrae but not the gut. The mouth is found at the anterior end of the animal, and the anus at the base of the tail. The defining characteristic of a vertebrate is the vertebral column, formed in the development of the segmented series of vertebrae. In most vertebrates the notochord becomes the nucleus pulposus of the intervertebral discs. However, a few vertebrates, such as the sturgeon and the coelacanth retain the notochord into adulthood. Jawed vertebrates are typified by paired appendages, fins or legs, which may be secondarily lost. The limbs of vertebrates are considered to be homologous because the same underlying skeletal structure was inherited from their last common ancestor. This is one of the arguments put forward by Charles Darwin to support his theory of evolution. Invertebrate Anatomy Invertebrates constitute a vast array of living organisms ranging from the simplest unicellular eukaryotes such as Paramecium to such complex multicellular animals as the octopus, lobster and dragonfly. By definition, none of these creatures has a backbone. The cells of single-cell protozoans have the same basic structure as those of multicellular animals but some parts are specialised into the equivalent of tissues and organs. Locomotion is often provided by cilia or flagella or may proceed via the advance of pseudopodia, food may be gathered by phagocytosis, energy needs may be supplied by photosynthesis and the cell may be supported by an endoskeleton or an exoskeleton. Some protozoans can form multicellular colonies. Evolutionary Morphology Morphology is a branch of biology dealing with the study of the form and structure of organisms and their specific structural features. Anatomical pathology Commonwealth or Anatomic pathology is a medical specialty that is concerned with the diagnosis of disease based on the macroscopic, microscopic, biochemical, immunologic and molecular examination of organs and tissues. Eidonomy Eidonomy is the study of the external appearance of an organism. It is thus the opposite of anatomy, which refers to internal morphology. While predominant early in the history of biology it is little studied in particular anymore as it is ripe with the effects of convergent evolution. It thus yields less new information about organisms than anatomy, and therefore the external appearance of lifeforms is usually studied as part of general investigations in morphology, e. Cytogenetical Sciences Cytogenetics is an exciting, dynamic field of study which analyzes the number and structure of human and animal chromosomes. Chromosomal abnormalities can happen when egg and sperm cells are being made, during early fetal development, or after birth in any cell in the body. Changes to chromosome structure can disrupt genes, causing the proteins made from disrupted genes to be missing or faulty. Depending on size, location, and timing, structural changes in chromosomes can lead to birth defects, syndromes or even cancer. Protozoology Protozoology is that branch of zoology which is concerned with the group of animals known as the Protozoa. Protozoa are unicellular, heterotrophic eukaryotes that have been studied for more than years, at first as microscopic curiosities, later as organisms causing disease and more recently as important components of ecosystems. Protozoans are common, and they are of particular interest to man because they cause such diseases as malaria, amoebic dysentery, and African trypanosomiasis sleeping sickness. Certain protozoans known as foraminifera, which have an extensive fossil record, are useful to geologists in locating petroleum deposits. Protozoans also serve as experimental organisms in many studies of cell and molecular biology. Developmental Biological Sciences Developmental biology is the study of the process by which animals and plants grow and develop, and is synonymous with ontogeny. In animals most development occurs in embryonic life, but it is also found in regeneration, asexual reproduction and metamorphosis, and in the growth and differentiation of stem cells in the adult organism. In plants, development occurs in embryos, during vegetative reproduction, and in the normal outgrowth of roots, shoots and flowers. Molecular Biology Molecular biology chiefly concerns itself with understanding the interactions between the various systems of a cell, including the interrelationship of DNA, RNA and protein synthesis and learning how these interactions are regulated. Molecular biology is the study of molecular underpinnings of the process of replication, transcription and translation of the genetic material.

Chapter 4 : Pdf Morphology, Anatomy, Taxonomy, And Ecology

Species diversity driven by morphological and ecological disparity: a case study of comparative seed morphology and anatomy across a large monocot order.

Find articles by John C. Collinson Find articles by Margaret E. Parkinson Find articles by Dilworth Y. Species diversity driven by morphological and ecological disparity: Abstract Phenotypic variation can be attributed to genetic heritability as well as biotic and abiotic factors. Across Zingiberales, there is a high variation in the number of species per clade and in phenotypic diversity. Factors contributing to this phenotypic variation have never been studied in a phylogenetic or ecological context. Seeds of species from all eight families in Zingiberales were analyzed for 51 characters using synchrotron based 3D X-ray tomographic microscopy to determine phylogenetically informative characters and to understand the distribution of morphological disparity within the order. All families are distinguishable based on seed characters. Non-metric multidimensional scaling analyses show Zingiberaceae occupy the largest seed morphospace relative to the other families, and environmental analyses demonstrate that Zingiberaceae inhabit both temperate and tropical regions, while other Zingiberales are almost exclusively tropical. Temperate species do not cluster in morphospace nor do they share a common suite of character states. This suggests that the diversity seen is not driven by adaptation to temperate niches; rather, the morphological disparity seen likely reflects an underlying genetic plasticity that allowed Zingiberaceae to repeatedly colonize temperate environments. The notable morphoanatomical variety in Zingiberaceae seeds may account for their extraordinary ecological success and high species diversity as compared to other Zingiberales. Cannaceae, Costaceae, Heliconiaceae, Lowiaceae, Marantaceae, Musaceae, Strelitziaceae, Zingiberaceae Introduction Understanding what processes account for the diversity of life on Earth is a fundamental question in biology. There are a myriad of factors and influences that contribute to the genotypic and phenotypic diversity of a taxon, including the complex evolutionary histories within and between species, the array of ecological space that a taxon inhabits and the overall developmental and genetic variation that provide the raw material for the evolution of new forms and functions Cowling et al. Documenting the morphological and anatomical diversity of organisms through time, incorporating data from both extant organisms and their extinct ancestors preserved in the fossil record, is fundamental to understanding diversity. By drawing correlations between current mechanisms of selection and those that may have been acting in the past, such studies can begin to address the tempo and mode of phenotypic changes that have occurred from deep time through to the present. This includes how past organisms may have responded to environmental variables or have developed ecological tolerances. Within angiosperms, the Zingiberales bananas, gingers and relatives are a large monophyletic order of monocotyledonous plants that serve as a model group for understanding the mechanisms underlying diversity through time Kress and Specht, Based on molecular sequence data, the Zingiberales underwent a proposed rapid radiation in the Cretaceous Kress and Specht, ; Sass et al. The Zingiberales are found primarily in the tropics and subtropics worldwide Kress et al. Previous studies have addressed the genetic basis for floral diversity in the group Specht and Bartlett, ; Bartlett and Specht, , ; Specht et al. In addition, the family Zingiberaceae has been shown to possess very morphologically diverse seed and embryo structures Benedict et al. An understanding of seed structural diversity will contribute to our ability to untangle the complex evolutionary history of this economically and ecologically important group of plants by allowing inclusion and re-evaluation of fossils, and, more broadly, to explore what factors independently influence the diversity of different lineages.

Chapter 5 : Journal of Morphology and Anatomy- Open Access Journals

Journal of Morphology and Anatomy is a peer reviewed, open access journal that aims to understand human anatomy by analyzing its structure, function, development and evolution. Priority will be given to the studies that clearly articulate their relevance to the anatomical community.

However, during the s and 40s morphology as a field shrank. This was likely due to the emergence of new areas of biological inquiry enabled by new techniques. The s brought about not only a change in the approach of morphological studies, resulting in the development of evolutionary morphology in the form of theoretical questions, and a resurgence of interest in the field. Together, these methodologies allowed morphologists to better delve into the intricacies of their study. It was then, in the s and 60s, that ecologists began to use morphological measures to study evolutionary and ecological questions. This culminated in Karr and James coining the term "ecomorphology" in Functional morphology differs from ecomorphology in that it deals with the features arising from form at varying levels of organisation. In other words, functional morphology focuses heavily on the relationship between form and function whereas ecomorphology is interested in the form and the influences from which it arises. Functional morphology studies often investigate relationships between the form of Skeletal muscle and physical properties such as force generation and joint mobility. Moreover, studies of functional morphology themselves provide insufficient data upon which to make conclusions regarding environmental adaptations of a species. For instance, increases in mouth size correspond to an increase in prey size. However, less obvious trends also exist. The prey-size of fish does not seem to correlate so much to body size as to the characteristics of the feeding apparatus. Behavioural studies[edit] The work above is just one example of an ecomorphology based behavioural study. Studies of this variety are becoming increasingly important in the field. Behavioural studies interrelate functional and eco-morphology. Features such as locomotory ability in foraging birds have been shown to affect dietary preferences by studies of this type. Griffen and Mosblack investigated differences in diet and consumption rate as a function of gut ecomorphology. Ecomorphological studies can often be used to determine to presence of parasites in a given temporospatial context as parasite presence can alter host habitat use. Much current work also focuses on the integration of ecomorphology with other comparative fields such as phylogenetics and ontogenetics to better understand evolutionary morphology. Z the realised niche of species 2 and X the niche overlap, where competition occurs among species. An understanding of ecomorphology is necessary when investigating both the origins of and reasons for biodiversity within a species. Ecomorphology is fundamental for understanding changes in the morphology of a species in which subsets occupy different ecological niches , demonstrate different reproductive techniques, and have various sensory modalities. Bony fishes are often used to study ecomorphology due to their long evolutionary history, high biodiversity , and multi-stage life cycle. This is largely due to cichlids having great biodiversity , wide distribution, the ability to occupy various ecological niches, and obvious morphological differences. Paleohabitat determination from ecomorphology[edit] The history of how a species has undergone morphological adaptations to better suit its ecological role can be used to draw conclusions about its paleohabitat. The morphologies of paleo-species found at a location help to make inferences about the previous appearance and properties of that habitat. Research using this approach has been widely conducted using bovid fossils due to their large skeletons and extensive species radiation. Evidence also suggests that further study of the ecomorphology of previously existing habitats may be useful in determining the phylogenetic risk associated with species living in a specific habitat. A background history of a species features and homology must first be known before a history of evolutionary morphology can be observed. This area of biology serves only to provide a nominal explanation of evolutionary biology, as a more in depth explanation of species history is required to provide a thorough explanation of evolution within a species. Ecomorphology versus habitat preference[edit] Suggestions have been made that the correlations between species biodiversity and particular environments may not necessarily be due to ecomorphology, but rather a conscious decision made by species to relocate to an ecosystem to which their morphologies are better suited. However, there are currently no studies that provide concrete evidence to support this theory. Studies have been conducted to predict fish habitat preference based on body morphology, but no definitive distinction could be made between correlation and causation of fish habitat preference.

Chapter 6 : Ecological Morphology: Integrative Organismal Biology by Peter C. Wainwright

Leaf anatomy and morphology were studied in 11 tree species growing in an undisturbed forest and the adjoining fynbos for over 50 years. Functional anatomical results suggest that the forest and the fynbos are ecologically distinct.

Mehedi Hasan Bangladesh J. An illustrated account is presented with a review of literature. Introduction Aldrovanda vesiculosa L. Droseraceae is a rare monotypic floating aquatic carnivorous plant. The genus was established by Linnaeus in Basak reported that since then the occurrence of this plant was not known until Sen Gupta collected it in from Dhaka, Bangladesh and Deb from Imphal, Monipur state in India in Cohn gave a comprehensive description of the taxon with reference to its morphology, anatomy and carnivorous food habit. Many workers including Monti , Caspary , Lassu , Mori , Roxburgh , Schoenfeld and Arber recorded the generic name of this plant as Aldrovandia while Linnaeus , Hooker , Prain , Sculthrope , De Wit , Heywood , Rendle , Aston and many other modern botanists call it Aldrovanda. During the recent few years a number of significant works have been done in Japan, Australia and many European countries on various aspects of A. Scientists are working on the ecology, physiology and mode of propagation in nature and also in laboratory conditions. Efforts are being made to bring the plant back to nature by tissue culture methods in Japan and elsewhere. Noteworthy works were done by Adamec , , and on the ecology, photosynthetic characteristics, seasonal growth dynamics, physiological polarity and mineral nutrition of A. Adamec and Lev have been working on the introduction of this plant in potential sites of the Czech Republic. Kaminski worked on the role of chemical factors on the distribution, and Komiya and Shibata worked on the environmental changes and their effect on growth of A. Morphology, ecology and distribution of A. The present communication deals with the physical, chemical and biological conditions of the Aldrovanda habitat and on the morphology of specimen collected. An area of ha is presently reduced to about 26, ha of which about ha retains water in summer till the next monsoon. The rest of the area has been reclaimed for rice cultivation. U Ahmed and M Zaman. The plant was collected again in by the first author from Chalan beel wetland 50 Km east of Rajshahi, during a regular phycological and limnological investigations. The plant material was collected by using hand net from deep clear water shaded by reeds and thickets of Nymphaea, Ricciocarpus natans L. Necessary microscopic studies, camera lucida drawings and photography have been made in the laboratory. Results and Discussion Taxonomic and some anatomical features with illustrations are presented in Figs while data on physical, chemical and biological conditions are given in Table 1. Pata jhanjhi Collection No. The slender jointed main axis is sparsely branched towards the basal region; the apical region profusely branched to give a dense crowded appearance Figs Each of this apical dense cluster of crowded whorls of leaves Figs become compact to form turions. The turion is a special structure for vegetative propagation Mainsonneuve , DeWit , Caspary Roxburgh noted the plant growing vegetatively without forming turions and the basal end dies away gradually. However, the present Chalan beel material was found with turions Fig. The stem is round and bears many bifid processes. The leaves in the whorl are equal in size. The broad petiole of each leaf terminates into a more or less circular bi-lobed lamina Fig. The petiole also produce four rigid projections on either side of the lamina lobe Fig. These stiff projections appear like tentacles, the tips of which are transformed into shaggy hair Figs The lobes are made of very delicate tissue with two layers of cells. When wide open the lobes give are almost circular appearance Fig. The midrib is few celled thick, rigid and holds the lamina like a strong hinge, similar to the trap of Dionaea Droseraceae. The upper side inner surface is found to have a large number of multi-cellular circular shaped colorless glands Figs These glands are either sessile or with short stalk. The gland appears densely on either sides of the midrib. The lower side of the lobe is flat and broad and made of two layers of long cylindrical cells and bear few gland cells and a large number Figs Aldrovanda vesiculosa L. Tip portion of the plant with Turions, 3. Mid portion of the plant with Turions arrow , Whorls with 7 and 8 leaves, 6. A single leaf with 4 tentacles. The mid rib bears many multi-cellular filamentous projections sensitive in nature Cohn, Arber, and De Wit As soon as any infusorian touches these hairs, the lobes close and the prey is imprisoned inside. A few reduced stomata were found to occur on the abaxial surface Fig. Anatomical structures of A. Leaf with open blades showing tentacles, midrib with sensitive hairs, digestive glands and absorptive cells, 8. A closed leaf with prey inside tightened with bent tencacles, 9. Sensitive multicellular filaments or hairs on the inner side of the midrib, Tips of tentacles converted into shaggy hairs, Tip of the midrib converted into a shaggy hair, Margin of the leaflets traps with short strong spines, Sessile and one-cell stalked digestive glands on the inner side of midrib and lamina. Two and 4 celled absorptive organs on the inner surface of leaflets traps , A reduced stoma on the outer surface of a leaflet. The physical, chemical and biological data clearly indicate the drastic changes in aquatic ecology of the Aldrovanda habitat Table 1. The redox characteristics including the DO, BOD, COD, Eh, rH2 indicate that in the beel water had minimum organic load which is supported by the lower value of electrolytic conductivity. The water was unpolluted and eutrophic in nature. The abundance of phytoplankton, zooplankton and other hydrophytes also support this fact. As mentioned earlier, the specimen was collected from a single habitat consisting of reeds and Nymphaea which probably created a suitable temperature regime for Aldrovanda. The redox characteristics and electrolytic conductivity in have changed indicating moderate organic load and moderate pollution of the Table 1. Physico-chemical and biological conditions of the Aldrovanda vesiculosa L. Limnological conditions Air temperature o C 26 28 27 Water temperature o C These conditions were probably absolutely in congenial for this plant. The Chalan beel wetland have silted up considerably during the recent years and turned into an annual flood plain and remains almost dry during period from late winter to mid-summer months. Like eurytopic Utricularia, the stenotopic Aldrovanda is extremely sensitive to the changes in the limnological conditions Chowdhury and Zaman and thus Aldrovanda has lost its habitat. Adamec and Kovarova held similar views. Utricularia in similar other habitats in the country survived the drastic environmental changes but Aldrovanda probably failed to cope with these changes and became critically endangered in this region also. A rigorous search should be undertaken to find live Aldrovanda plant and through biotechnological methods it may be brought back to nature again. References Adamec L Ecological requirements and recent European distribution of the aquatic carnivorous plant Aldrovanda vesiculosa L. Photosynthetic characterstics of the aquatic carnivorous plant Aldrovanda vesiculosa L. Seasonal growth dynamics and overwintering of the aquatic carnivorous plant Aldrovanda vesiculosa L. Rootless aquatic plant Aldrovanda vesiculosa L.: Ademec L and J Iev The introduction of the aquatic carnivorous plant Aldrovanda vesiculosa L. Adamec L and M Kovarova Field growth characterstics of two aquatic carnivorous plants, Aldrovanda vesiculosa L. Standard methods for examination of water and waste water. 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Chapter 7 : Hyphaene â€" Morphology and anatomy

anatomy, morphology, life history and systematics of Cipango- paludina japonica, a Japanese species that has been introduced into North America, to resolve taxonomic confusion and to im -.

Vegetative and reproductive characteristics[edit] A diagram representing a "typical" eudicot. Plant morphology treats both the vegetative structures of plants, as well as the reproductive structures. The vegetative somatic structures of vascular plants include two major organ systems: These two systems are common to nearly all vascular plants, and provide a unifying theme for the study of plant morphology. By contrast, the reproductive structures are varied, and are usually specific to a particular group of plants. Structures such as flowers and fruits are only found in the angiosperms ; sori are only found in ferns ; and seed cones are only found in conifers and other gymnosperms. Reproductive characters are therefore regarded as more useful for the classification of plants than vegetative characters. Use in identification[edit] Main article: Identification key Plant biologists use morphological characters of plants which can be compared, measured, counted and described to assess the differences or similarities in plant taxa and use these characters for plant identification, classification and descriptions. When characters are used in descriptions or for identification they are called diagnostic or key characters which can be either qualitative and quantitative. Qualitative characters are morphological features such as leaf shape, flower color or pubescence. Both kinds of characters can be very useful for the identification of plants. Alternation of generations[edit] Main article: Alternation of generations The detailed study of reproductive structures in plants led to the discovery of the alternation of generations , found in all plants and most algae , by the German botanist Wilhelm Hofmeister. This discovery is one of the most important made in all of plant morphology, since it provides a common basis for understanding the life cycle of all plants. Pigmentation in plants[edit] Main article: Plant color The primary function of pigments in plants is photosynthesis , which uses the green pigment chlorophyll along with several red and yellow pigments that help to capture as much light energy as possible. Pigments are also an important factor in attracting insects to flowers to encourage pollination. Plant pigments include a variety of different kinds of molecule, including porphyrins , carotenoids , anthocyanins and betalains. All biological pigments selectively absorb certain wavelengths of light while reflecting others. The light that is absorbed may be used by the plant to power chemical reactions, while the reflected wavelengths of light determine the color the pigment will appear to the eye. Morphology in development[edit] Main article: Plant development Plant development is the process by which structures originate and mature as a plant grows. It is a subject studies in plant anatomy and plant physiology as well as plant morphology. The process of development in plants is fundamentally different from that seen in vertebrate animals. When an animal embryo begins to develop, it will very early produce all of the body parts that it will ever have in its life. When the animal is born or hatches from its egg , it has all its body parts and from that point will only grow larger and more mature. By contrast, plants constantly produce new tissues and structures throughout their life from meristems [4] located at the tips of organs, or between mature tissues. Thus, a living plant always has embryonic tissues. The properties of organization seen in a plant are emergent properties which are more than the sum of the individual parts. Meristem , Cellular differentiation , Morphogenesis , and Plant embryogenesis A vascular plant begins from a single celled zygote , formed by fertilisation of an egg cell by a sperm cell. From that point, it begins to divide to form a plant embryo through the process of embryogenesis. As this happens, the resulting cells will organize so that one end becomes the first root, while the other end forms the tip of the shoot. In seed plants, the embryo will develop one or more "seed leaves" cotyledons. By the end of embryogenesis, the young plant will have all the parts necessary to begin in its life. Once the embryo germinates from its seed or parent plant, it begins to produce additional organs leaves, stems, and roots through the process of organogenesis. New roots grow from root meristems located at the tip of the root, and new stems and leaves grow from shoot meristems located at the tip of the shoot. Growth from any such meristem at the tip of a root or shoot is termed primary growth and results in the lengthening of that root or shoot. Secondary growth results in widening of a root or shoot from divisions of cells in a cambium. This occurs when individual cells or groups of cells grow longer. Not all plant cells will grow to the same length. When cells on one side of a stem grow longer and faster than cells on the other side, the stem will bend to the side of the slower growing cells as a result. Plant growth and development are mediated by specific plant hormones and plant growth regulators PGRs Ross et al. Morphological variation[edit] Plants exhibit natural variation in their form and structure. While all organisms vary from individual to individual, plants exhibit an additional type of variation. Within a single individual, parts are repeated which may differ in form and structure from other similar parts. This variation is most easily seen in the leaves of a plant, though other organs such as stems and flowers may show similar variation. There are three primary causes of this variation: Evolution of plant morphology[edit] Transcription factors and transcriptional regulatory networks play key roles in plant morphogenesis and their evolution. During plant landing, many novel transcription factor families emerged and are preferentially wired into the networks of multicellular development, reproduction, and organ development, contributing to more complex morphogenesis of land plants. The lobed leaves come from the base of the plant, while the unlobed leaves come from the top of the plant. Although plants produce numerous copies of the same organ during their lives, not all copies of a particular organ will be identical. There is variation among the parts of a mature plant resulting from the relative position where the organ is produced. For example, along a new branch the leaves may vary in a consistent pattern along the branch. The form of leaves produced near the base of the branch will differ from leaves produced at the tip of the plant, and this difference is consistent from branch to branch on a given plant and in a given species. This difference persists after the leaves at both ends of the branch have matured, and is not the result of some leaves being younger than others. Environmental effects[edit] The way in which new structures mature as they are produced may be affected by the point in the plants life when they begin to develop, as well as by the environment to which the structures are exposed. This can be seen in aquatic plants and emergent plants. Temperature[edit] Temperature has a multiplicity of effects on plants depending on a variety of factors, including the size and condition of the plant and the temperature and duration of exposure. The smaller and more succulent the plant , the greater the susceptibility to damage or death from temperatures that are too high or too low. Temperature affects the rate of biochemical and physiological processes, rates generally within limits increasing with temperature. When water freezes in plants, the consequences for the plant depend very much on whether the freezing occurs intracellularly within cells or outside cells in intercellular extracellular spaces. The cells undergo freeze-drying, the dehydration being the basic cause of freezing injury. The rate of cooling has been shown to influence the frost resistance of tissues, [13] but the actual rate of freezing will depend not only on the cooling rate, but also on the degree of supercooling and the properties of the tissue. These freeze-dehydrated buds survived immersion in liquid nitrogen when slowly rewarmed. Floral primordia responded similarly. In boreal species of Picea and Pinus, the frost resistance of 1-year-old seedlings is on a par with mature plants, [15] given similar states of dormancy. Juvenility[edit] Juvenility in a seedling of European beech. There is a marked difference in shape between the first dark green "seed leaves" and the lighter second pair of leaves. The organs and tissues produced by a young plant, such as a seedling , are often different from those that are produced by the same plant when it is older. This phenomenon is known as juvenility or heteroblasty. For example, young trees will produce longer, leaner branches that grow upwards more than the branches they will produce as a fully grown tree. In addition, leaves produced during early growth tend to be larger, thinner, and more irregular than leaves on the adult plant. Specimens of juvenile plants may look so completely different from adult plants of the same species that egg-laying insects do not recognize the plant as food for their young. Differences are seen in rootability and flowering and can be seen in the same mature tree. Juvenile cuttings taken from the base of a tree will form roots much more readily than cuttings originating from the mid to upper crown. Flowering close to the base of a tree is absent or less profuse than flowering in the higher branches especially when a young tree first reaches flowering age. He emphasized that homology should also include partial homology and quantitative homology. How intermediates between the categories are best described has been discussed by Bruce K. When plants on the graph were placed according to their actual nutrient travel distances and total branch lengths, the plants fell almost perfectly on the Pareto curve. Based on the environment and the species, the plant is selecting different ways to make tradeoffs for those particular environmental conditions. Rutishauser and Isler emphasized that this approach is not only supported by many morphological data but also by evidence from molecular genetics. James concluded that "it is now widely accepted that In fact, it is simply the timing of the KNOX gene expression!. According to this approach, structures do not have process es , they are process es. In a detailed case study on unusual morphologies, Rutishauser illustrated and discussed various topics of plant evo-devo such as the fuzziness continuity of morphological concepts, the lack of a one-to-one correspondence between structural categories and gene expression, the notion of morphospace, the adaptive value of bauplan features versus patio ludens, physiological adaptations, hopeful monsters and saltational evolution, the significance and limits of developmental robustness, etc.

Chapter 8 : Ecomorphology - Wikipedia

Below the most important points of the ecological morphology and physiology of corals are discussed. The anatomy of polyps and the morphology of corallites and of.

Chapter 9 : Plant morphology - Wikipedia

Ecomorphology or ecological morphology is the study of the relationship between the ecological role of an individual and its morphological adaptations. The term "morphological" here is in the anatomical context.