

Ecology and Biological Processes of Animals

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Commentary

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DESCRIPTION

Animals are multicellular, eukaryotic organisms in the biological kingdom Animalia. With few exceptions, animals consume organic material, breathe oxygen are able to move, can reproduce sexually and grow from a hollow sphere of cells, the blastula, during embryonic development. Animals range in length from 8.5 micrometres to 33.6 metres. They have complex interactions with each other and their environments, forming intricate food webs. The scientific study of animals is known as zoology. Most living animal species are in Bilateria, a clade whose members have a bilaterally symmetric body plan. The Bilateria include the protostomes, containing animals such as nematodes, arthropods, flatworms, annelids and molluscs, and the deuterostomes, containing the echinoderms and the chordates, the latter including the vertebrates. Life forms interpreted as early animals were present in the Ediacaran biota of the late Precambrian. Many modern animal phyla became clearly established in the fossil record as marine species during the Cambrian explosion, which began around 539 million years ago 6,331 groups of genes common to all living animals have been identified; these may have arisen from a single common ancestor that lived 650 million years ago.

Historically, Aristotle divided animals into those with blood and those without. In modern times, the biological classification of animals relies on advanced techniques, such as molecular phylogenetics, which are effective at demonstrating the evolutionary relationships between taxa. Humans make use of many animal species, such as for food (including meat, milk and eggs) for materials (such as leather and wool), as pets and as working animals including for transport. Dogs have been used in hunting, as have birds of prey, while many terrestrial and aquatic animals were hunted for sports. Nonhuman animals have appeared in art from the earliest times and are featured in mythology and religion.

All animals are composed of cells, surrounded by a characteristic extracellular matrix composed of collagen and elastic glycoproteins. During development, the animal extracellular matrix forms a relatively flexible framework upon which cells can move about and be reorganized, making the formation of complex structures possible. This may be calcified, forming structures such as shells, bones, and spicules. In contrast, the cells of other multicellular organisms (primarily algae, plants and fungi) are held in place by cell walls and so develop by progressive growth. Animal cells uniquely possess the cell junctions called tight junctions, gap junctions and desmosomes.

With few exceptions in particular, the sponges and placozoans animal bodies are differentiated into tissues. These include muscles, which enable locomotion and nerve tissues, which transmit signals and coordinate the body. Typically, there is also an internal digestive chamber with either one opening or two openings. Animals are categorized into ecological groups depending on how they obtain or consume organic material, including carnivores, herbivores, omnivores, detritivores and parasites. Interactions between animals form complex food webs. In carnivorous or omnivorous species, predation is a consumer resource interaction where a predator feeds on another organism. Selective pressures imposed on one another lead to an evolutionary arms race between predator and prey, resulting in various anti-predator adaptations. Almost all multicellular predators are animals. Some consumers use multiple methods; for example, in parasitoid wasps, the larvae feed on the hosts' living tissues, killing them in the process but the adults primarily consume nectar from flowers. Other animals may have very specific feeding behaviors, such as hawksbill sea turtles primarily eating sponges. Most animals rely on the biomass and energy produced by plants through photosynthesis. Herbivores eat plant material directly, while carnivores and other animals on higher trophic levels typically acquire it indirectly by eating other animals. Animals oxidize carbohydrates, lipids, proteins and other biomolecules, which allows the animal to grow and to sustain biological processes such as locomotion. Animals living close to hydrothermal vents and cold seeps on the dark sea floor consume organic matter of archaea and bacteria produced in these locations through chemosynthesis. Animals originally evolved in the sea. Lineages of arthropods colonized land around the same time as land plants, probably between 510 and 471 million years ago during the Late Cambrian or Early Ordovician. Vertebrates such as the lobe-finned fish Tiktaalik started to move on to land in the late Devonian, about 375 million years ago. Animals occupy virtually all of earth's habitats and microhabitats, including salt water, hydrothermal vents, fresh water, hot springs, swamps, forests, pastures, deserts, air and the interiors of animals, plants, fungi and rocks.