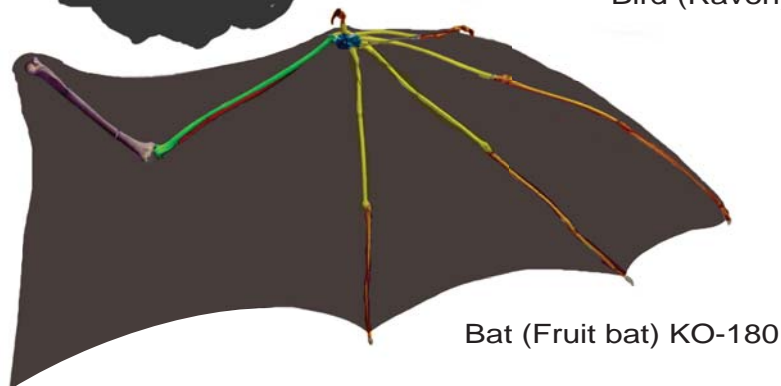
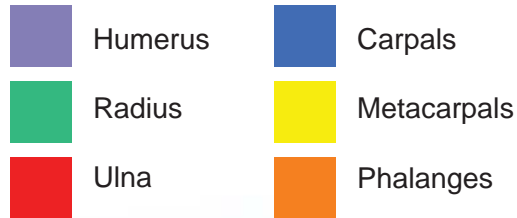


COMPARATIVE FORELIMBS

homologous vs. analogous & divergent vs. convergent



Homology: something is the SAME as something else.

Analogy: something is LIKE, or similar to, something else, but NOT THE SAME.

As **FORELIMBS**, the human arm, bird wing and bat wing are homologous. The limb served the SAME function: as a forearm (not a wing) in the last common ancestor of tetrapods. Over time, the limb diverged, taking different forms to fulfill different functions.

As **WINGS**, the bird wing and bat wing are analogous. They are similar to each other in function, performing as wings for flight, but have evolved differently. The bird wing is a modified tetrapod arm, the bat wing is a modified mammal hand. Over time, the limbs converged, becoming similar in form and function.

Homologous and analogous limb structures

Homologous: Similar structure – common ancestry. (Forelimbs)
Corresponding in evolutionary origin, position, and structure, but not necessarily in function.
Divergent evolution: from the same, becoming different in form and function.
(from Ancient Greek *homós* “same” + *lógos* “account, explanation, narrative”)

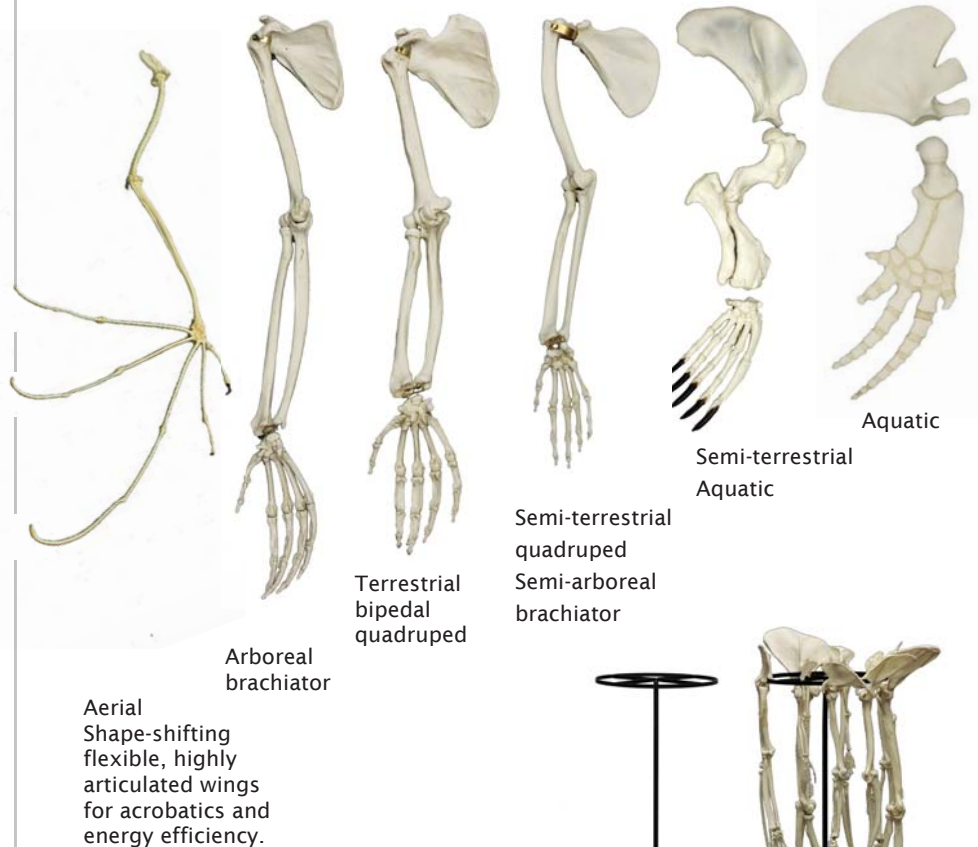
Analogous: Similar function – different ancestry. (Wings)
Corresponding in function, but having evolved separately
Convergent evolution: from different, in order to perform similar function, becoming similar.
Form may not match, as in bird vs. bat wings.
(from Greek *ana-* a word forming element meaning “against, backward, or back” + *lógos* “account, explanation, narrative”)

Bird forelimbs (wings)

Mammal forelimbs

SC-332-67-A Black-footed Albatross
SC-068-67-A Bald Eagle
SC-074-67-A Raven

KO-180 Fruit Bat
SC-002-67-AS Orangutan
SC-028-67-AS Gorilla
SC-069-67-AS Vervet
KO-285 Seal
KO-233-SET Dolphin



S-067-AS
Circular Arm Stand

Please note: Limbs (including hindlimbs) from all of our skeletons may be ordered. Please check our website for additional species, including: human (differing ages, sex and ancestry), additional non-human primates, colugo, manatee, dog, horse, komodo dragon, goliath frog, duck-billed platypus, and additional birds. For limbs without sku numbers, please contact customer service.





The Pentadactyl Tetrapod Limb


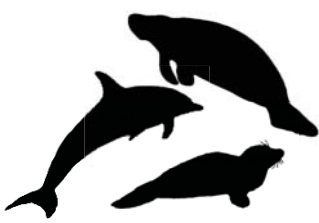








Tetrapod: A member of the group made up of amphibians, reptiles, birds and mammals, having evolved from a common four-limbed ancestor.
(from Greek *tetra*- 'four' + *pous* 'foot.')

Pentadactyl: Five-fingered; five-toed
(from from Ancient Greek *pénte*, "five" + Greek *daktylos*, fingers or toes)

Limb (biology): An extremity or appendage that is distinct from the head and trunk; an arm, leg, flipper or wing.
(from Old-English *lim*, "branch, part, or member;" also Latin *limbus*, "border or edge")

Many pentadactyl tetrapods use limbs for locomotion, such as walking, running, flying, climbing, digging and swimming. Some use their front and/or hind limbs to tear, grasp, carry and/or manipulate objects. In each species, the limb has evolved to fulfill its job; its form enables its function.

Tetrapod pentadactyl limbs may be analyzed and compared to ascertain what environmental and evolutionary pressures led to morphological changes (in other words: how an animal's environment and use of its limbs affected their shape), as well as how different species are related.

| <u>Flying</u> (forelimb) | <u>Swimming</u> (forelimb) | <u>Tearing</u> (forelimb) | <u>Grasping</u> (forelimb/hand) | <u>Walking & Running</u> (forelimb) |
|--|---|---|--|---|
| bird, bat | dolphin, manatee, seal | bear | primates, human | some primates, horse, dog |
|  |  |  |  |  |
| Fruit Bat KO-180 | Manatee KO-146 | Bear SC-114 | Aye-aye KO-163 | Horse SC-125-67-AS |
| Raven SC-074-67-A | Dolphin KO-233-SET | | Chimpanzee SC-003-67-AS | Mandrill SC-010-67-AS |
| | Seal KO-285 | | Human SC-092-67-AS | Dog SC-344 |
|  |  |  |  |  |



THE TETRAPOD LIMB

The ancestral tetrapod pentadactyl limb plan, subsequently adapted by modification for different uses and habitats

The ancestral limb plan consists of three parts: upper (arm or thigh) containing one long bone, middle (forearm or shank) containing two long bones, and lower (hand or foot) containing a number of small bones.

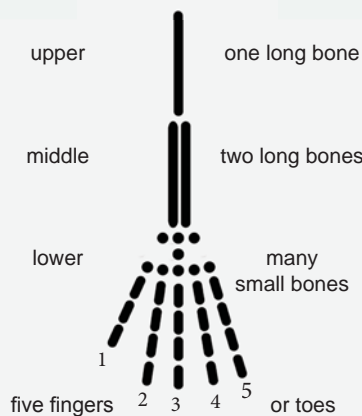
The last common ancestor of the group of animals called tetrapods occurred in the Devonian Period, about 360 million years ago. This animal happened to have four limbs with five fingers. Its evolutionary descendants have retained this basic plan, with adaptations for how the animal uses the limb. In some cases modification includes the fusion or loss of bones.

Through divergent, or radiating, evolution the descendants of the earliest tetrapod evolved into animals adapted to widely different ecological niches and environments. Some of these animals exist only in the fossil record. Others became the animals we know today as amphibians, reptiles, birds and mammals.

FORELIMB from the pectoral girdle

| Body part & function | Name of bone |
|----------------------|-------------------------|
| upper arm | humerus |
| lower arm (forearm) | radius & ulna |
| wrist | carpals |
| hand | metacarpals & phalanges |

artist's interpretation



HINDLIMB from the pelvic girdle

| Body part & function | Name of bone |
|----------------------|-------------------------|
| upper leg (thigh) | femur |
| lower leg (shank) | tibia & fibula |
| ankle | tarsals |
| foot | metatarsals & phalanges |

Individual bones or sets of bones from any of our skeletons may be ordered. See our website.

Amphibian

Goliath Frog
SC-094



Reptile

Komodo Dragon
SC-027



Bird

Bald Eagle
SC-068



Mammal

Large Dog (Bullmastiff)
SC-344

