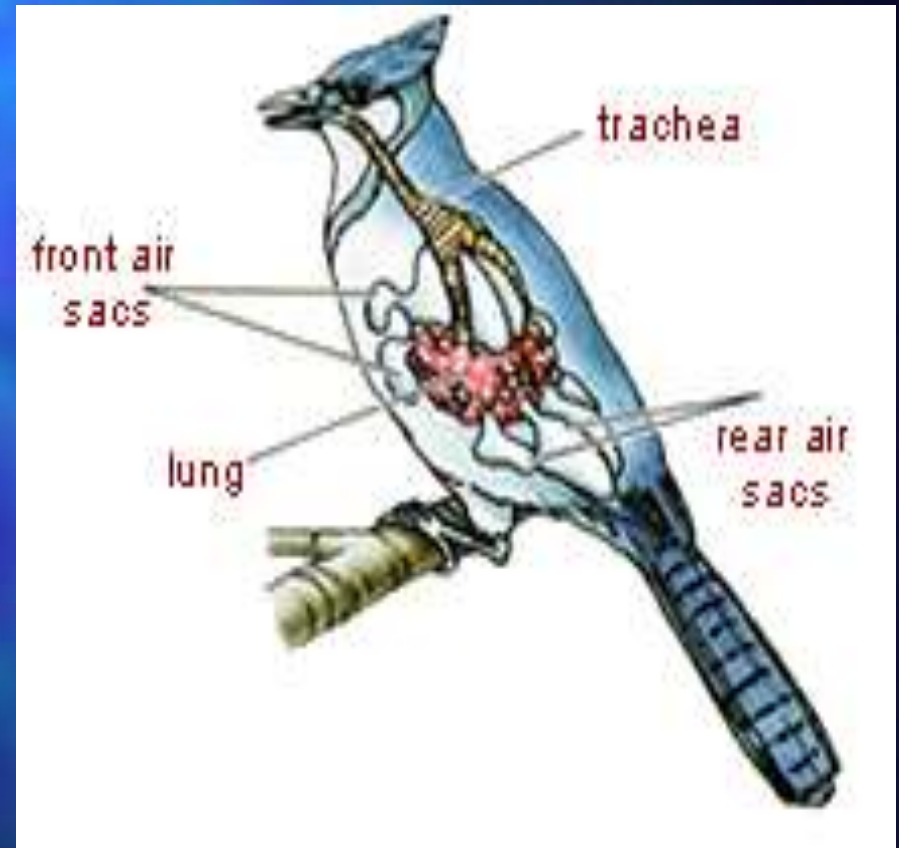


Excretory System

- The avian excretory system is also efficient and light weight
- The two kidneys filter a nitrogenous waste called uric acid from the blood
- → highly concentrated uric acid travels by ducts called ureters to the cloaca, where along with undigested matter from the intestines, it is excreted in a semisolid, usually white mass

Respiratory System

- Air enters through paired nostrils at base of beak → Down trachea past syrinx, or song box → enters two primary bronchii → to lungs → 75% bypasses the lungs and flows directly to posterior to sacs → sacs connect with air spaces in bones, filling the hollow bones with air
- When bird exhales the carbon dioxide-rich air from the lungs, oxygen rich air is forced out of the posterior air sacs into lungs via small air tubes



Circulatory System

- 4 chambered heart
- Right and left sides completely separated
- Right side receives deoxygenated blood from the body and pumps it to the lungs
- Left side receives deoxygenated blood from the lungs and pumps it to the rest of the body
- Has a single aortic arch
- Most birds have a rapid heart beat compared to other vertebrates-Hummingbird-600 times a minute

Nervous System

- Birds have a large brains, relative to their size
- Cerebellum coordinates movement
- Cerebrum controls complex behavior patterns such as navigation, mating, and nest building
- Optic lobe receives and interpret visual stimuli
- Keen vision is necessary for taking off, landing, spotting landmarks, hunting and feeding
- Have good color vision
- Birds large eyes are located near the sides of its head, giving a bird a wide field of vision

Nervous system

- Birds large eyes are located near the sides of its head, giving a bird a wide field of vision
- Birds with eyes near the front of the head have better binocular vision
- Hearing important to nocturnal species that rely on sounds to help them locate prey
- Birds lack internal ears-ear canal leads to a tympanic membrane, called an eardrum
- Sense of smell is poorly developed except in ducks and flightless birds
- Sense of taste helps birds avoid bitter-tasting or toxic foods

Reproductive System

- Male bird sperm is produced in two testes that lie beneath the kidneys
- Sperm passes through small tubes called Vasa deferentia into the male's cloaca
- During mating the male presses his cloaca to the female's and releases sperm
- Female's single ovary releases eggs into a long, funnel-shaped oviduct where they are fertilized by sperm



Reproductive System

- Reproductive System Cont.
- Fertilized eggs move down the oviduct, where they receive protective covering and a shell
- Unfertilized egg consists of a nucleus, cytoplasm, and a yoke
- When fertilized, the embryo is suspended in albumen, the egg white
- The liquid medium is supported by ropelike strands of material called chalaza that are attached to the shell membrane
- Female has a shell gland that secretes a protective calcium carbonate shell to surround the egg

Development and Behavior



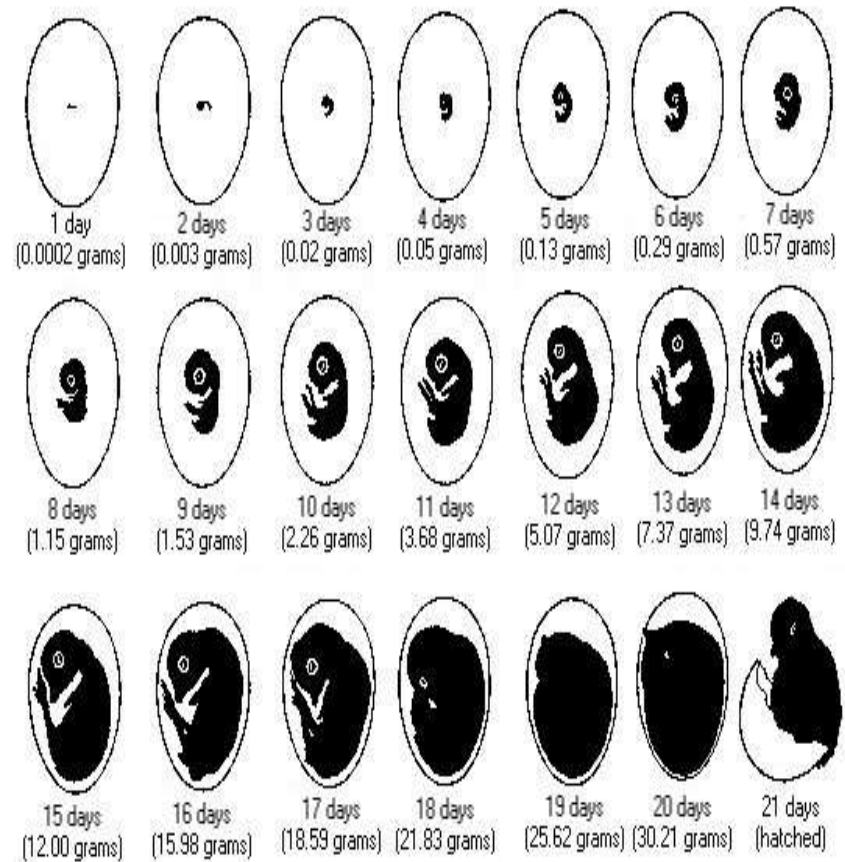
Incubation and Development

- A female bird usually lays eggs in the nest. One or both parents will incubate or warm the eggs by sitting on them.
- They cover them with a thick, featherless patch of skin on their abdomen called a brood patch.
- In penguins the male emperor heats the egg by placing it on his webbed feet and enfolding it with his warm abdomen.



Incubation and Development

- Embryo development begins when the zygote forms a plate of cells on the surface of the yolk.
- This plate begins to form the tissues and organs
- The membrane produces digestive enzymes that dissolve proteins and lipids in the yolk.
- Blood vessels in the yolk sac membrane carry the nutrients to the embryo.
- When hatching begins the embryo makes a star-shaped crack in the shell with a scalelike egg tooth.
- The chick presses and scrapes the shell until the crack widens enough for the chick to emerge.
- The egg tooth, falls off soon after the chick hatches.



DAILY CHANGES IN THE WEIGHT AND FORM
OF THE DEVELOPING CHICK EMBRYO (WHITE LEGHORN)

Incubation and Development

- Bird have two contrasting methods for rearing young.
- Those that lay many eggs and incubate them for long periods hatch precocial young.
- These birds are active as soon as they hatch, they can walk, swim, and feed themselves. For examples ducks and quail.
- Birds that lay only a few eggs and hatch quickly produce altricial young.
- They depend on both parents for several weeks. For ex. Woodpeckers, hawks, pigeons parrots.



Behavior

- The long periods of parental care may enable birds to learn such complex behaviors as courtship, nesting, and migration.
- Young birds need protection until they develop the strength to fly and obtain food



Territoriality and Courtship

- During the breeding season many male birds establish an area that they defend against other males of their species, a behavior called territoriality.
- The male then attempts to attract a female to share this territory.
- Once a territory is established most birds engage in a period of courtship, behavior that is designed to attract a mate.
- Many males attract females by means of their brightly colored feathers.
- Some males combine song with flight displays.



Nest Building

- Nests hold eggs, conceal young birds from predators, provide shelter from the elements, and sometimes even serve to attract a mate.
- Most birds build nests in sheltered, well-hidden spots—from holes in the ground to treetops.
- As a further adaptation to their environment, birds construct their nests of almost any material available.
- Twigs, grasses, feathers, and mud are the most common materials used.



Migration

- When temperatures drop and the food supply dwindles, these birds migrate to warmer climates.
- Birds rely on a variety of cues to help them navigate.
- Some species monitor the position of the stars or the sun.
- Others rely on topographical landmarks, such as mountains.
- Magnetic cues, changes in air pressure, and low –frequency sounds may also provide information to migrating birds.
- The ability of birds to read these cues, along with their many adaptations for flight, enables them to migrate to and inhabit virtually any environment.

