

## SOME ADAPTATIONS & IMPERFECTIONS

CHECK THE CATEGORY COLUMN APPROPRIATE FOR EACH FEATURE

AD= Adaptation

CO= Contrivance

VE= Vestigial

AT= Atavism

FEATURES	AD	CO	VE	AT
1. OUR SPINAL COLUMN				
2. OUR LARYNX				
3. OUR EUSTACHIAN TUBE				
4. HUMAN TAILS				
5. "WISDOM TEETH"				
6. OUR EAR-WAGGING MUSCLES				
7. SICKLE-CELL ANEMIA				
8. FLIPPERS ON SEALS AND SEA-LIONS				
9. TREE KANGAROOS: LEGS & FEET				
10. ANTEATERS TEETH (IN EMBRYOS ONLY)				
11. SALAMANDERS: GILLS & FINS IN EMBRYOS ONLY				
12. HOLLOW BONES IN FLYING BIRDS				
13. HOLLOW BONES IN FLIGHTLESS BIRDS				
14. CAVE DWELLING ANIMALS: SIGHTLESS EYES				
15. MALE BOOBY BIRDS: NESTING MATERIAL GATHERING				
16. SOME BEETLES: USELESS WINGS (under wing covers)				
17. SOME WHALES: SOMETIMES W/ PELVIS, THIGH BONES				
18. BALEEN WHALES: TEETH IN EMBRYOS ONLY				
19. PYTHONS & BOAS: W/ PELVIS & TINY LIMBS				
20. PANDA'S "THUMB" (WRIST BONE ---> 6TH DIGIT)				
21. EXTRA HORSE TOES				
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## SOME ADAPTATIONS & IMPERFECTIONS: Details & Key

Read or relate the following details to the class while showing the check-table on the overhead projector. Codes shown at end of each item below is the expected category to be checked on table.

1. **Our spinal column**, clearly homologous to the "suspension bridge" support structure in tetrapods, must serve as a vertical load-bearing column in people, bringing an abundance of classic back problems when its support is compromised. (CO)
2. **Our larynx**: Occupies a lower level than it does in other animals (creating a larger space in our throat and pharynx for tongue movements and other changes for generating complex subtle sounds (speech), but creates a liability in that our food path crosses the air path, making us more likely to choke, compared to other animals, since food can become more easily caught in our air path. (CO)
3. **Our Eustachian tube** (ear canal), homologous to a gill cleft in fishes, serves to equalize air pressure on opposite sides of our eardrum. Small changes in air pressure (due to altitude change, or other cause), can bring severe ear pain, especially if the tube is swollen closed due to a cold, and is often subject to infection. (CO)
4. **Human tail**: Always on our embryo (VE). Sometimes, babies are born with a fleshy tail (AT).
5. **Our "wisdom teeth"** (3rd molars), sometimes never develop, often become impacted, may require surgical removal. Is this "wise design", or the unfortunate result of reduced facial projection as the teeth reduced in size over the course of human evolution?. (VE)
6. **Our ear-wagging muscles**. (VE)
7. **Sickle Cell Anemia**: caused by a molecular mechanism which, in a moderate (heterozygous) dose, protects against malaria, but in its full dose (homozygous recessive), produces disabling disease of sickle cell anemia. (CO)
8. **The flippers of seals and sea lions** are clearly homologous to the legs of tetrapods, and work quite well in the water, but make for very clumsy locomotion on land. (CO)
9. **Tree kangaroos** show some limited adaptations of their limbs to arboreal existence, but they are still relatively clumsy in the trees; they are also not as fit for ground activity as their ground-dwelling relatives are. (CO)
10. **Anteaters develop teeth** during fetal development and then lose them before birth. (VE)
11. **Terrestrial salamanders develop gills and fins** but only during fetal development. (VE)
12. **Flying birds possess hollow bones**. (AD)
13. **Flightless birds** (e.g. ostriches, moa, emus, penguins) **also possess hollow bones**. In terrestrial birds, hollow bones cannot provide nearly the structural support found in other terrestrial vertebrates. (VE)
14. **Many cave-dwelling animals possess sightless eyes**. (VE)
15. **Male booby birds** court females with nesting material then mate with them, throw the nesting material away, and the females lay their eggs on the bare ground. (VE)
16. **Some beetles have useless wings** sealed beneath wing covers (elytra). (VE)
17. **Certain whales sometimes possess a pelvis and thigh bones**. (AT)
18. **Some baleen whales have teeth** (embryos only) (VE)
19. **Pythons and boa constrictors possess a pelvis and tiny limbs**. (VE)
20. **Panda's thumb**: sixth "digit" formed from a wrist bone. While it is functionally a digit, it is structurally different from the digits of all other mammals. (CO)
21. **Extra toes found occasionally on horses**: Usually duplicates of the main (3rd) toe, but sometimes they develop from the enlarged "splint" bones (vestigial toes 2 and 4). (AT)

**REMEMBER, THE EMPHASIS HERE:** Notice the **MANY IMPERFECTIONS** in living things (not their categories); are these most likely the result of poor design, poor engineering, or normal evolution?