Class 1, competition 3: Evolution of flight

In the early 1860s, the first known bird was discovered: the Archaeopteryx. It was identified as the halfway point between birds and reptiles, providing an evolutionary link. Paleontologists in the 1970's realized that the Archaeopteryx had numerous commonalities with a family of carnivorous dinosaurs called Theropods. Birds are believed to have descended from these creatures, some evolving to become smaller, with the potential to move into trees in search of shelter and food. In this essay, I am going to discuss some of the common features between birds and their ancestors.

Occasionally, some breeds of birds hatch chicks with claws on the end of their wings- the Hoatzin from South America is an example. Hoatzins avoid flying, although adults can when necessary. They usually climb and shimmy their way around the lower branches of trees. They are folivores so have no need for extreme heights, but, considering they live near rivers and tend to build their nests in greenery close by, their young need to be able to climb out of the nest without drowning. This claw has been linked back to those of Theropods, as creatures such as the T. rex had small, weak arms, but vicious claws. It could even be argued that birds have retained the aggressive attitudes of their ancestors (as anyone who has ever seen seagulls and an unattended chip box can testify) although most animals are somewhat territorial anyway. Another characteristic of the Hoatzin that can be compared to its Jurassic counterparts is its multicolored crest. In dinosaurs, their feathers were originally sparse, but gradually became thickener and used for insulation, such as with the Deinonychus. They are then believed to have evolved into small, wing-like structures which helped them move faster (a parallel can be drawn with ostriches in this case.) Some fossils have been found to still contain melanosomes, giving paleontologists an idea into the colours of feathers and, therefore, their purpose. Today, birds have a plethora of uses for their feathers, from camouflage to shade for eggs, to attract mates, be aggressive, as insulation or for flight. Their bones are deliberately hollow and are strengthened with struts. They also have a rigid skeleton (as it is better for flight.) An example of an obvious similarity between bird and Theropod skeletons is the presence of a wishbone. This is not present in most creatures but is designed in order for the bird to fly better, as well as to have somewhere to place the bird's strongest muscles.

One of the many similarities between birds and theropods is their ability to walk on two legs. Whilst many birds that can fly tend to hop (such as sparrows and finches, moving around the upper branches of a tree) larger birds, such as ostriches and emus, walk or even run. An ostrich can sprint up to an average speed of 40 mph. This is because, for creatures that cannot fly, it is more energy efficient to walk rather than hop. Given that ostriches can weigh from 63 to 145kg, this would require an inordinate amount of food to fuel the flight, regardless of the amount of muscle. Furthermore, ostriches can take strides of 10 to 16 ft, and use their wings to help change direction and balance. Some theories suggest that this is how dinosaurs originally evolved into birds, by using weak, wing-like structures to facilitate running. This made hunting prey and fleeing predators easier, making those creatures the strongest in that terrain and their offspring more likely to survive.

Birds and dinosaurs use oxygen and breathe out carbon dioxide, as all warm blooded animals do, but unlike the majority of warm blooded animals, birds have a one way air flow system, with parabronchi going to air sacs instead of lungs. These air sacs are not involved directly in gas exchange, but facilitate gaseous exchange and increase oxygen capacity. Birds also use air sacs to dissipate excess body heat as they have no sweat glands to cool down with. This can be linked to the Aerosteon which was named after its bird-like respiratory system, with air sacs within a cavity in its body, like birds. This is further evidence of the Mesozoic ancestors of birds. In this essay I have attempted to identify some of the common traits between dinosaurs and birds which evolved into characteristics necessary for

flight. I have discussed examples of birds that show a direct link with their Jurassic ancestors and how palaeontologists have interpreted these.