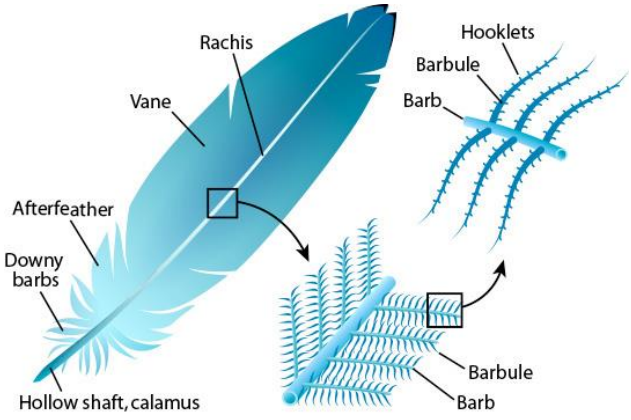
The modern day dinosaur: Marvel of Flight

Feathers. Being the plumage of the bird, feathers are pivotal in a bird's ability to fly. They are epidermal growths that exist on dinosaurs and avian (with some exceptions on non-avian). Other than soaring in the sky, feathers have other uses - these include protection, keeping warm, camouflaging, and attracting mates. But how do birds use these growths as a means to take flight and soar? They provide a light surface for pushing against the air, and as the wings are pushed down, the feathers converge together to help push the air. Then when it flaps upward, the feathers part to allow air to pass through.

To begin, scientists have established that birds are modern day living dinosaurs. Palaeontologists have discovered dozens of dinosaurs with trace amounts of feather preserved on their bodies. At first, these ancient ancestors had straight wiry feathers. Then, these wires diverged and formed branches and continued to evolve into more complex structures that we see today. As well, these feathers not only spread out in structure, but also on the body of dinosaurs – extending to the legs.

Small theropods (the group of dinosaurs that birds evolved from) like the Sinosauropteryx are believed to have evolved the first feathers. In other theropods, there are new types of feathers that have a vane-like structure (flat surface of a feather) where the barbs (stiff filaments attached to the rachis or the middle) are structured – it's extremely similar to the feathers of modern birds.



(Anatomy of a modern day feather – Birdtricks.com)

(Feather present in a fossil of a dromaesaurid – evolution.berkeleu.edu

Another evolutionary change to help birds fly was the wrist bones taking on a semi-circular structure that allowed the sideways rotation of the hands. This permitted the movement of wing joints that created thrust. Later on, they continued evolving – many bones were reduced and joined together which aided in an increase in the efficiency of flight. Other changes were: bone walls becoming thinner; feathers longer; vanes asymmetrical; bony tail reducing to a stump; and arms becoming longer. These changes helped improve flight, improve stability, and helped birds switch from running to flight.

Moreover, there is the adaptation of their respiratory system to aid in flight. As expected, a bird's respiratory system is large (around a fifth of its body volume compared to our one-twentieth) and super-efficient due to the strenuous and demanding activity of flight. There are also thin-walled air sacs in the front called the anterior, and the posterior are in the back. These create a one-way flow of air through the bird's lungs. On first inhalation, the air passes into the posterior, then moved into the lungs while exhaling. With the next inhalation takes place, air already in the lungs moved into the anterior air sacs while the second breath of air moves into the posterior sacs. Finally, on second exhalation, the air from the anterior sacs escapes out of the bird and the one-way system of the lungs and air sacs is complete.