Fruits of Evolution: Birds

When it comes to evolutionary journeys, the birds have an epic story to tell with some unexpected beginnings.

PRACTICAL SCIENCE WITH PHIL FREDA

When you look at birds, what do you think of?

Is it flight, feathers or beaks?

These qualities are the telltale signs of a bird, but did you know that birds came from creatures that didn't have any of these features?

What may be more surprising is that the ancient ancestors of modern birds were some of the largest and most awesome creatures that have ever inhabited the earth.

If you are thinking dinosaurs, you're right!
As strange as it may sound, those little robins, finches and pigeons that frequent your yards and gardens evolved from the some of the most massive dinosaurs!
Let's take a look at how it happened with help from PBS's Evolution website.

From "saurus" to "soarin'"

Bird evolution is an ongoing puzzle that has been nothing short of challenging for biologists and paleontologists.
This is primarily due to the fact that bird bones, which are light and hollow, rapidly decompose.

This makes searching for, and finding, fossils extremely difficult.

The oldest known bird fossil belongs to a creature which you may have heard of called *Archaeopteryx lithograpica*, or just *Archaeopteryx* for short.
Archaeopteryx lived approximately 150 million years ago and was relatively small.

It had long legs with three claw-equipped toes and teeth instead of a beak. What makes *Archaeopteryx* a plausible ancestor of modern birds is the fact that it also sported feathers.

Archaeopteryx is seen as the earliest known member of the lineage of modern birds by scientists, but it still retained many dinosaur-like features, including teeth and forelimbs instead of true wings.

After *Archaeopteryx*, two different bird-like dinosaurs were found in China that dated between 145 million and 125 million years ago.

The group of dinosaurs that are believed to be the ancestors of birds are called theropods.

Two famous dinosaurs seen in *Jurassic Park*, Velociraptor and Tyrannosaurus rex, are actually part of this group.
Theropods are categorized by certain features including hollow bones, a wishbone, a backward-facing pelvis and a three-toed foot.

Small, bird-like theropods would have scurried about much like a modern roadrunner.

As time went on, the forelimbs and "hands" became progressively longer and, in some theropods, the wrist bone evolved to allow the joint to flex sideways.

This would allow for the theropod to fling its hands forward to rapidly catch prey. The action would have been supported by the wishbone.
The point of discussing this is, after functional and computational analysis, scientists have discovered that this snatching motion is identical to the flight stroke of modern birds.

Over the course of the next 150 million years, birds evolved into what we see today.

The teeth and "hands" of *Archaeopteryx* gave way to beaks and wings over time.

During this transitional period, after the dinosaurs went extinct, the birds evolved to take over the skies and even land.

Since the dinosaurs were gone and our mammalian ancestors were still rat-like, nocturnal tree dwellers and diggers, large flightless carnivorous birds stalked the land while birds of prey ruled the sky.

The evolution of birds was unchecked by any competition and was allowed to explode into many paths.

This superiority allowed the birds to master almost every niche thinkable on Earth, including the following:

- **Fruit, insect, nectar and nut eaters** such as hummingbirds and finches.
- **Meat-eating hunters** such as owls, falcons and eagles.
- **Scavenging birds**, which include vultures and buzzards
- **Master fishing fowl** such as kingfishers, herons and cranes.
- **Aquatic birds** such as albatrosses and gulls.
- **Arctic birds** including the penguin species.
- **Flightless birds** such as the emu and the ostrich.

Birds have truly conquered almost every imaginable environment, and their diversity is only rivaled by insects.

I understand that it may be hard to understand or imagine how modern birds could have evolved from large, reptilian, dinosaur-like ancestors.

Fortunately, there is a bird that still exists today that points to the theropod ancestors of birds.

It is called the Hoatzin (*Opisthocomus hoazin*) and is found in the swamps, forest and mangrove ofthe Amazon in South America.
This bird is the only extant (living) bird of its genus, and its chicks possess a truly astounding feature.

When born, the Hoatzin chicks possess two claws on each wing, which they use to move about the tree branches and even swim with.
This looks eerily similar to the fossil records of *Archaeopteryx.*

What's even more interesting is that, it is likely that none of Hoatzin's common ancestors or closest relatives have this feature.

This means that since Hoatzin is the only known bird to sport this feature for millions of years, it is expressing genetic information that is probably present in the bird's genome, but is not expressed by any other bird.

In order words, the genetic information is latent.

Another example is in humans. All human fetuses, during development, have gill slits, which, over time, are reabsorbed and not seen again.

It is obvious that we humans do not need gills to breathe, but the genetic information to make gills, or parts of gills, is still present in our DNA, after millions and millions of years of evolution!

This is what is essentially happening with the Hoatzin.

Today, we have learned that birds have evolved from some amazing, unexpected ancestors and that their evolutionary story is one that is only rivaled by whales when it comes to massive change and adaptation.

The next time you eat chicken or turkey, just think about what you are actually eating.

I bet you never knew you were eating a highly evolved theropod dinosaur before!

I also don't think that you will ever look at birds quite the same way ever again.

Think about it!