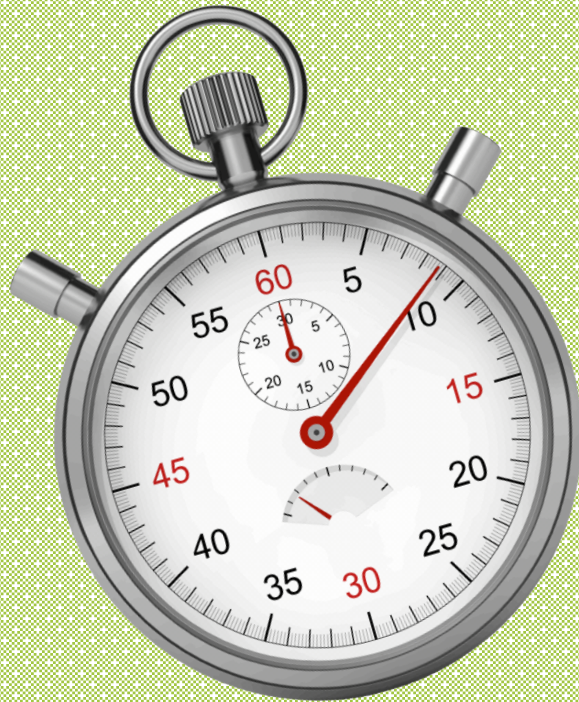


All about

# The Evolution of Birds

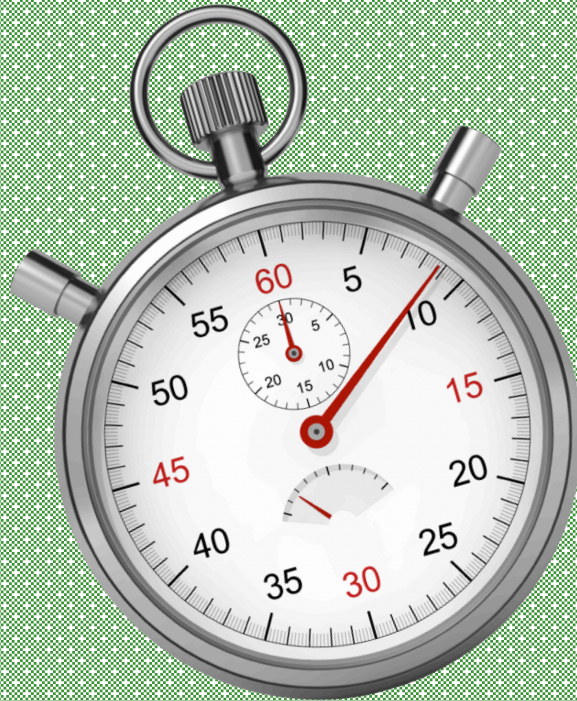


# Getting Started



**Task One** - You have one minute to brainstorm all the words you associate with birds.

**Task Two** - Now do the same for all the words you associate with dinosaurs.



**STOP!**

Now look back at  
your lists. Do they  
have any words in  
common?



Did you know that the birds you see in your garden today are directly descended from dinosaurs like Tyrannosaurus Rex and the Velociraptor?



Over thousands of years these dinosaurs began to slowly change and became more and more like the birds we see today.

Q: Does anybody know the name for this scientific process?

E O L O N

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Q: Does anybody know the name for this scientific process?

E V O L U T I O N

# Feathers

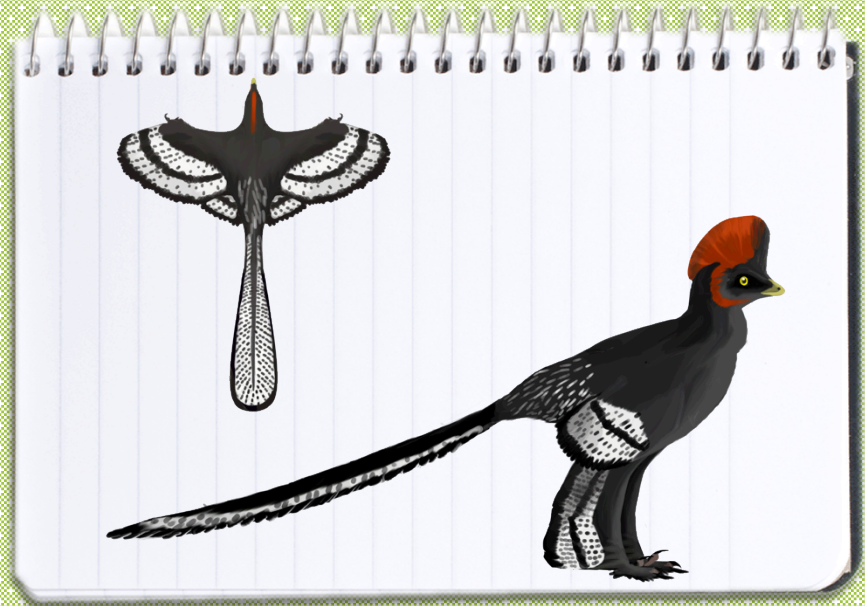


Over time, the dinosaurs started to develop sharp talons to kill their prey, stood up straight and stopped walking on their forelimbs (arms) and even grew feathers on all or part of their bodies.



One dinosaur, the **Anchiornis**, even grew feathers all over his legs! Here is an illustration of what he might have looked like.

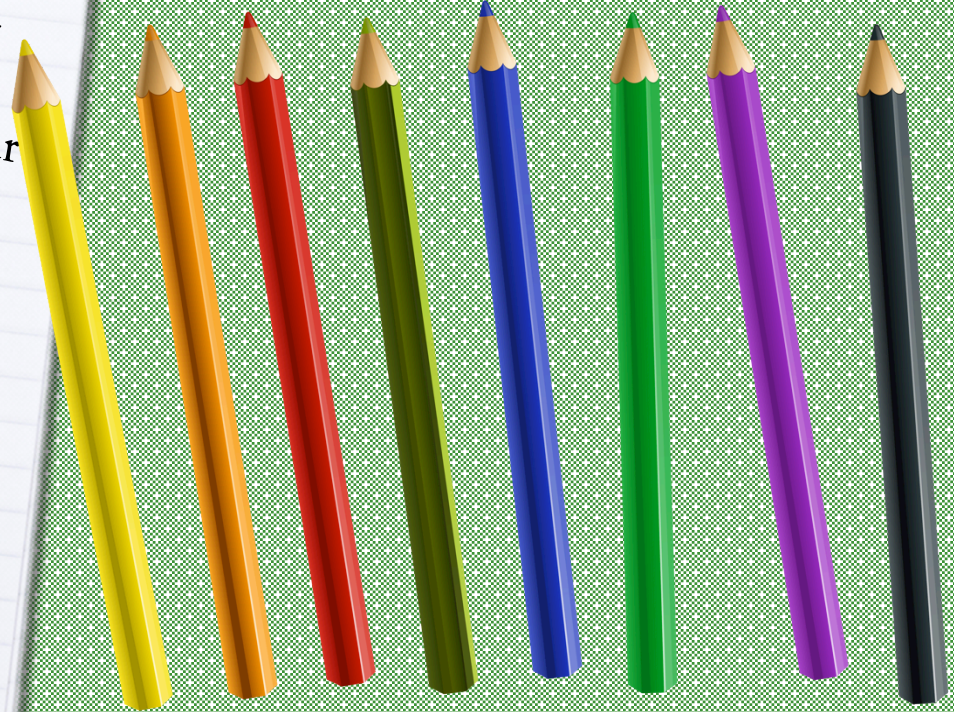
**Q:** What do you think were the advantages of having feathers everywhere? What could the disadvantages be?





Q: Think you can do a better job? Create your own imaginary dinosaur that has some bird-like features. Draw and label a picture of it. What will you call it?

The Doyouthinkhesawus, maybe? (there's a joke in there somewhere!)



# Learning to Fly



So how did these bird-like creatures learnt o fly? That's something scientists have been arguing about for years! There are three main theories...





Tree down theory.

Ground up theory.

Controlled ambush  
theory.

Can you  
guess what  
each of these  
theories are?

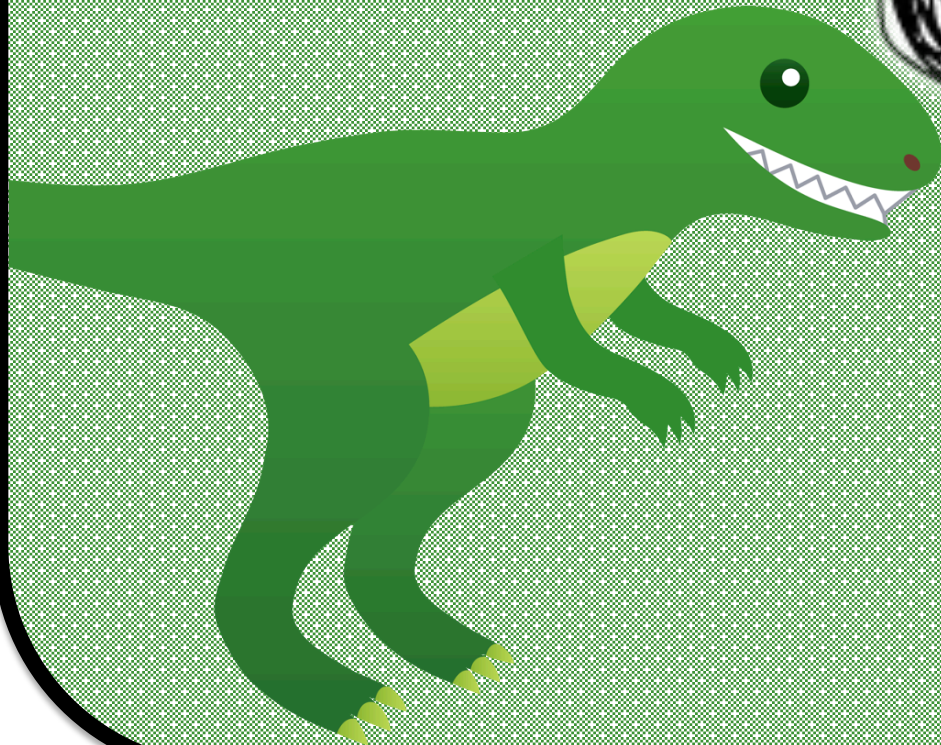
**Tree down theory.**

Bird ancestors climbed trees to leap onto their prey, and used their feathers to glide down.

**Ground up theory.**

Bird ancestors chased prey on the ground, developing feathers and a tail to help them balance.

**Controlled ambush theory.** Bird ancestors developed feathers to create drag whilst pouncing and enable them to glide onto their prey in a more controlled manner.



Q: Can you think of your own theory as to why the dinosaurs developed flight? Try to convince the rest of the class that your theory is the most believable in sixty seconds.

The **Archaeopteryx** was the first recognizable bird-like fossil found.

Q: What raptor-like features can you identify?

Q: What bird like features can you identify?



Scientists have worked out from the skeleton that the **Archaeopteryx** was not evolved enough for sustained, powered flight, although it was probably capable of gliding for short distances.

**Q:** What do you think stopped it from flying properly?



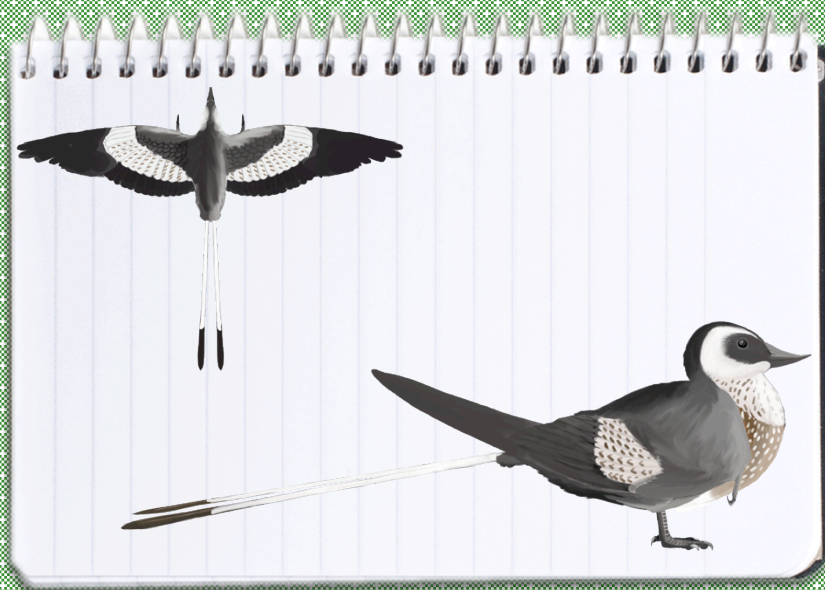


Q: Want to know more about the Archaeopteryx? We have a replica fossil of one at the Booth Museum on Dyke Road. Why not come and take a look?





Sometimes, lines of evolution went a bit wrong and didn't survive. Here is a picture of an early bird called a **Confuciusornis**, which is now extinct. Their skeletons were very heavy and they must have found flying quite difficult.



Here is a picture of a  
an early sea bird called  
an **Ichthyornis**, which  
translates as 'fish  
bird'. Their skeletons  
suggest they were  
quite good at flying,  
but they are unusual  
as they still had the  
toothed jaws of  
raptors inside their  
beaks. They are also  
extinct.



# Adaptation



Some lines of evolution were successful, and eventually turned into the birds we know today.

Q: What features do you think these creatures developed to make them successful?



The creatures started to develop:

- Hollow bones
- Air sacs to allow them to take in more oxygen
- Bastard wings (a special group of feathers on the front of the wing, sometimes called a bird's 'thumb')
- Flight feathers (large wing feathers)
- Short bony tail with long feathers

Q: How do you think each of these helped them to fly? Match up the squares on the next slide.



Flight feathers (large wing feathers)

Gives the bird more 'lift' when travelling at low speed, to stop it crashing

Hollow bones

Helps the bird maintain energy whilst in flight, including at high altitudes

Air sacs to allow them to take in more oxygen

A 'rudder' to allow the bird to change direction mid-flight

Bastard wings (a special group of feathers on the front of the wing, sometimes called a bird's 'thumb')

Can be brought in close for maximum speed and extended to increase height

Short bony tail with long feathers

Reduces the weight of the bird and allows it to fly at with minimal energy

Flight feathers (large wing feathers)

Can be brought in close for maximum speed and extended to increase height

Hollow bones

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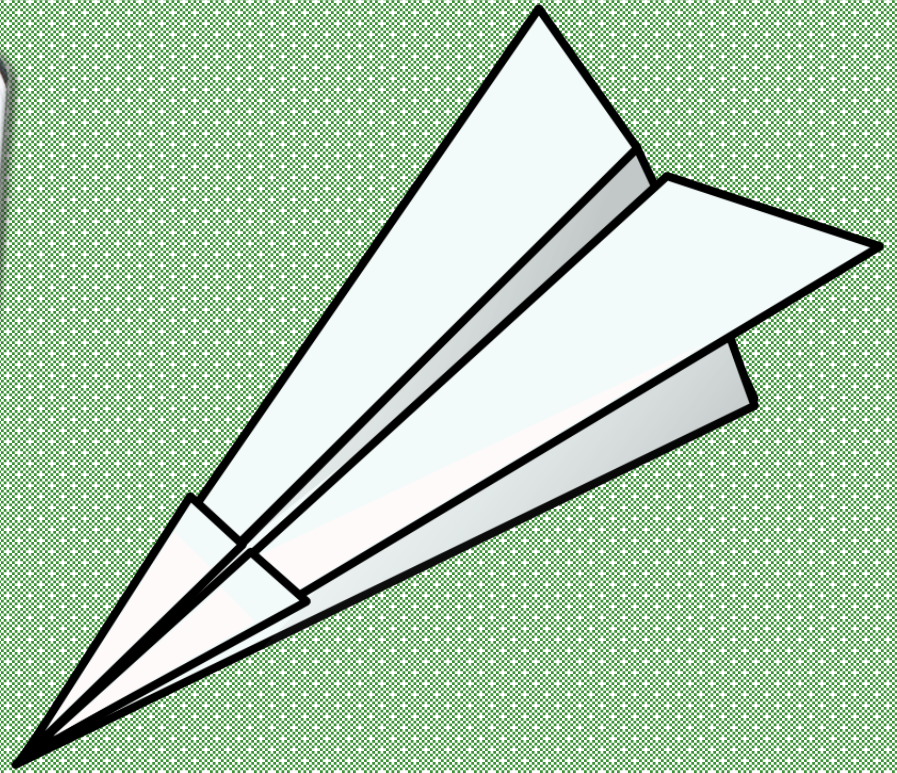
Gives the bird more 'lift' when travelling at low speed, to stop it crashing

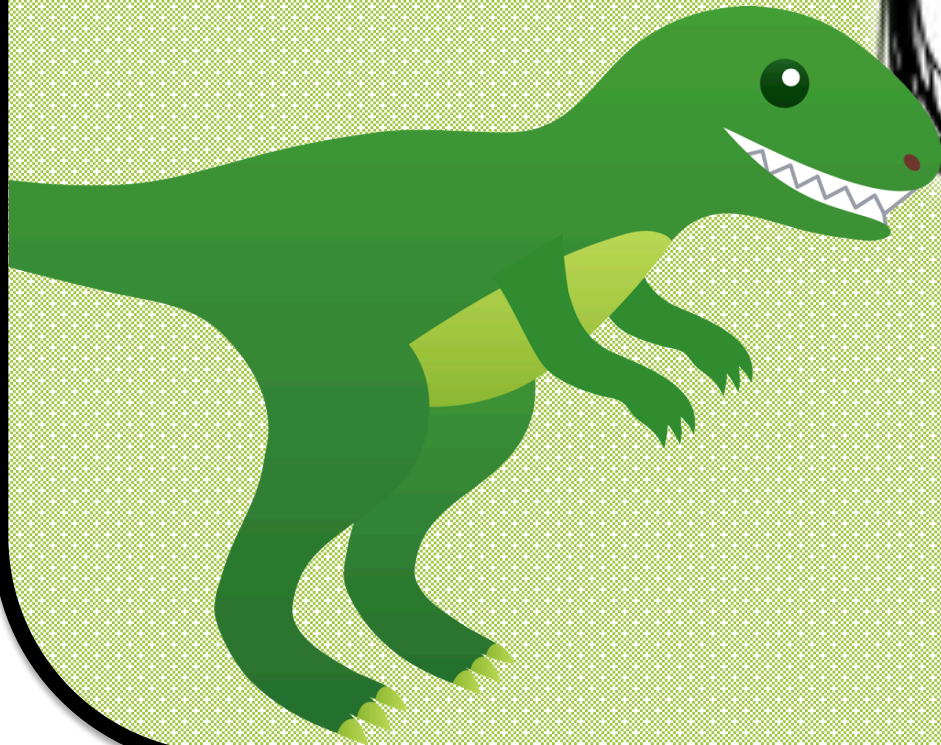
Short bony tail with long feathers

A 'rudder' to allow the bird to change direction mid-flight

Make a paper aeroplane and throw it. Now throw it again with a blob of blu-tac attached to the front.

**Q:** Did you have to put more energy into making it go the same distance the second time? This is exactly why birds needed to make themselves as light as possible.

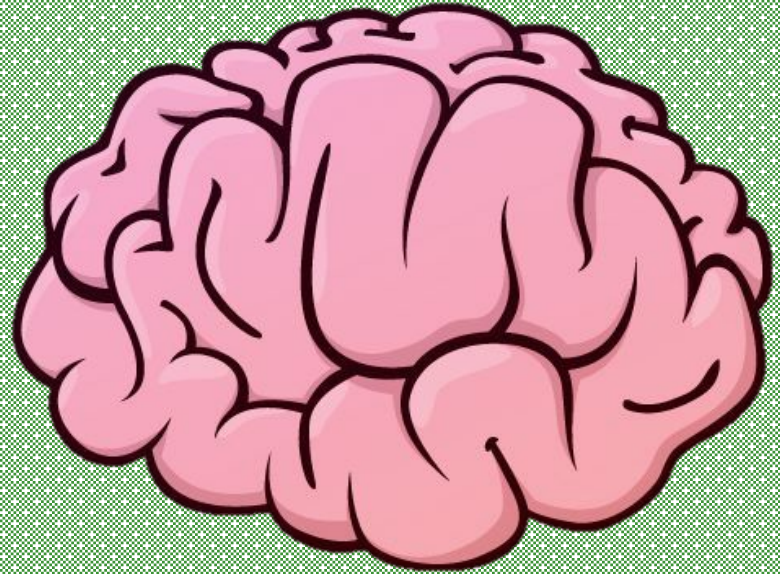


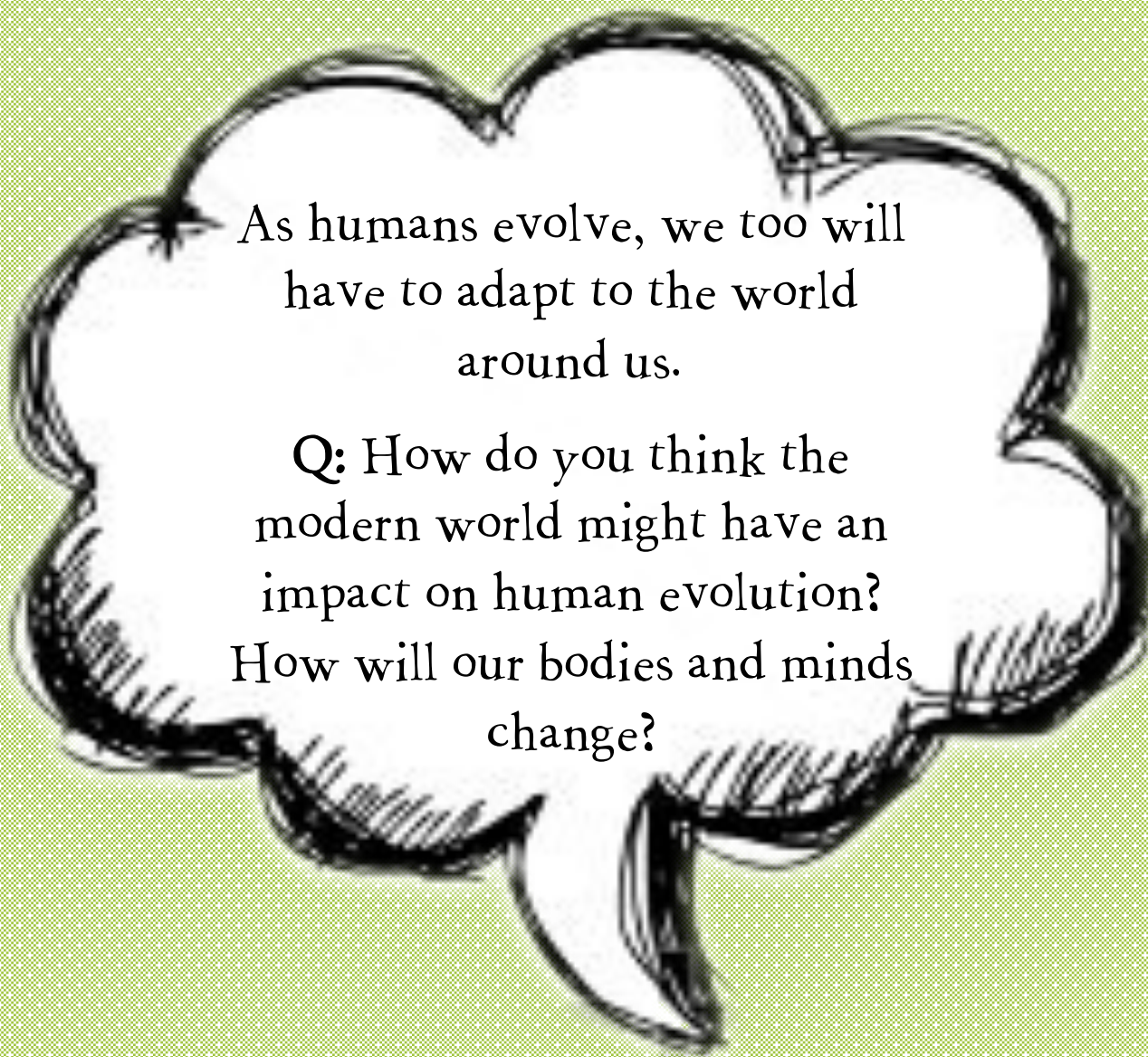


Q: Why do you think developing flight helped these creatures to survive and evolve so successfully? What else do you think these creatures had to develop to ensure their survival?



Perhaps the most important aspect the successful species developed was their big brains. This allowed the birds to solve problems and to learn and remember information, allowing them to find shelter, build nests and create simple tools to dig out difficult to reach food.

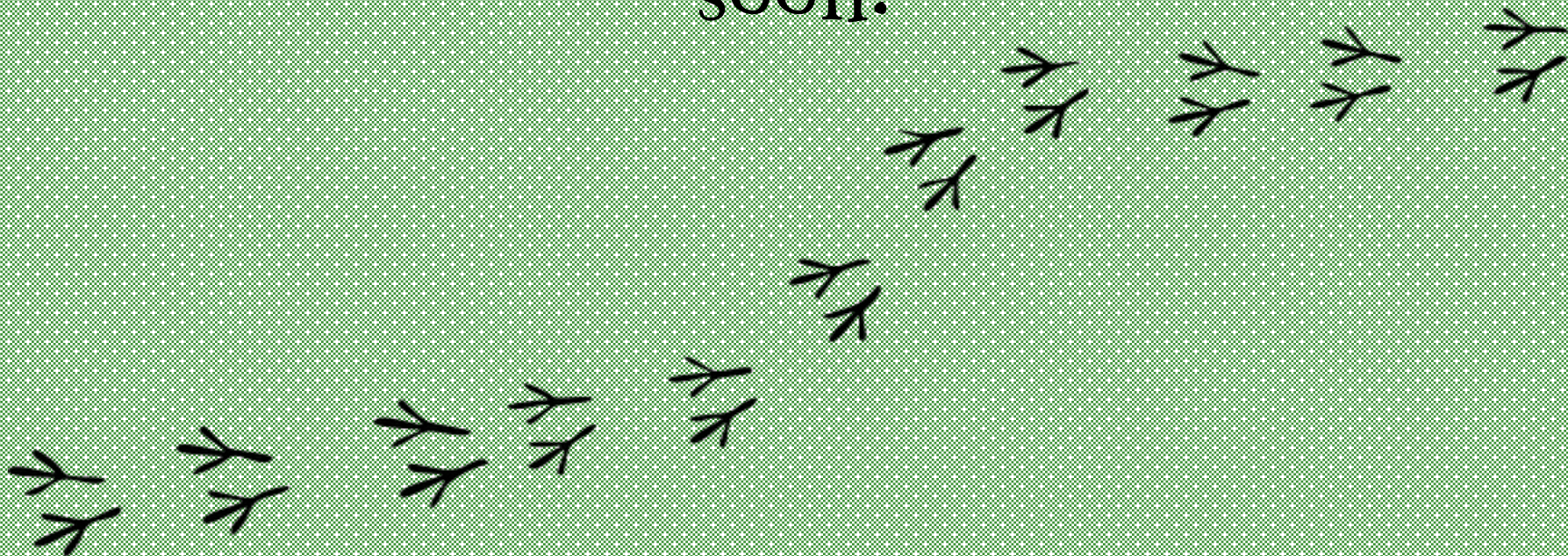




As humans evolve, we too will  
have to adapt to the world  
around us.

**Q:** How do you think the  
modern world might have an  
impact on human evolution?  
How will our bodies and minds  
change?

Thanks for downloading, see you  
soon!



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Dinosaur illustrations by Matthew Martyniuk