

Gary Skimmer

PTEROSAURS

FLYING REPTILES

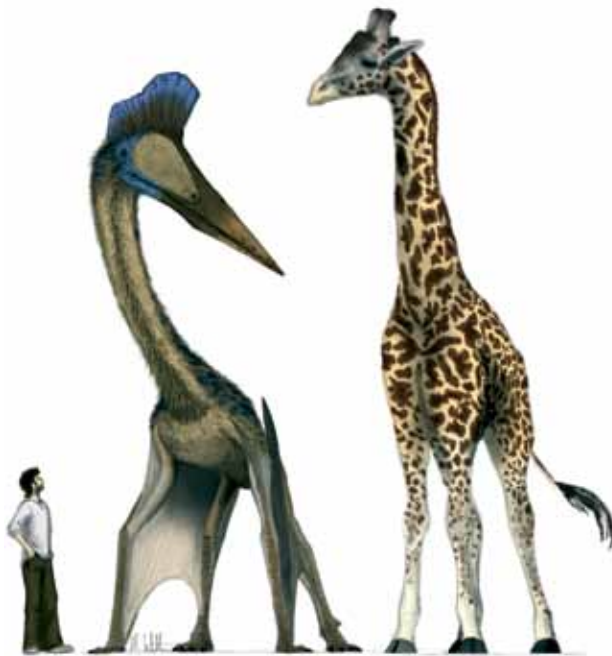
Key words

dinosaur
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Pterodactyls were one specific group of pterosaurs.

*Bird watching during the Mesozoic Era, the expanse of time stretching between 245 and 65 million years ago, would have been a very different experience to what it is today. **Mark Witton** of Portsmouth University explains why.*

Strictly speaking, birdwatching could only have begun 145 million years ago; prior to this point, only bird-like feathery dinosaurs, were around. These bird-ancestors were the pterosaurs, a group of flying reptiles with membranous wings, fuzzy bodies, and often savage-looking teeth. They disappeared with all the non-birdy dinosaurs 65 million years ago.



Pterosaurs were sometimes gigantic. The largest spanned 10 m across the wings and stood over 5 m tall, shown here alongside a Masai giraffe and a man of average height.

Although the fossil record is extremely patchy, palaeontologists have documented around 130 different species. The configuration of the pterosaur skull is definitively reptilian, and they are probably related to modern crocodiles and birds.

The inside view

Like birds or bats, pterosaur anatomy was primarily geared to meet the demanding requirements for flight. Their shoulder girdles and upper arm regions were large and complex to house enormous flight muscles, while further out on their forelimbs the bones became slender and elongated to create the leading edge of their wings. Much of the wing length was comprised of an elongated finger (the equivalent of our ring finger) that folded away when the animal was grounded.



The skeleton of a 7-metre wingspan Pteranodon

The flight surface itself was a thin but complex membrane that stretched from the tip of the wing finger to the ankle. As pterosaurs evolved, their necks and heads became increasingly large and their tails shorter. With such oversize arms, the bodies and legs of most pterosaurs look small.

As with modern birds, many pterosaur bones were pneumatized – that is, full of air. Air sacs in bones were probably linked to the lungs, so it seems that pterosaurs had an ultra-efficient, bird-like breathing apparatus where air is continuously pushed through a solid lung by contraction of different air sacs. This may explain how pterosaurs achieved wingspans of up to 10 m while birds and bats have, at most, managed 7 m and 1.5 m wingspans, respectively.



The distribution of air sacs (shown in blue, green and grey) and lungs (red) within the pterosaur body

Pterosaur brains also share many similarities with those of birds, highly developed in regions that deal with muscular coordination and response control. Wrapping all these features up was a layer of fuzz or 'pycnofibres', a hair-like integument that covered their faces, necks, bodies and the tops of their limbs.

Getting high

How did pterosaurs fly? Today, we have convincing evidence that pterosaurs could take off from land and sea from a standing start using all four limbs and, once airborne, flapped powerfully to propel themselves through the sky.



A 7 m span Pteranodon pushes itself into the air using its arms like an oversize vampire bat.

Larger pterosaurs could exploit thermal upwellings, ocean winds or updrafts and so could cover thousands of kilometres in single flights if necessary. Some species were adapted for marine or terrestrial soaring, highly agile in-flight predation of insects or, by contrast, high-velocity bursts of very directional flight.

When they weren't flying

Research since the 1980s has revealed that early pterosaurs were adept climbers and would have spent much of their time scampering around trees or rock faces, but their descendants quickly became efficient walkers, runners and waders. Pterosaur trackways are easily recognisable thanks to their almost human-like footprints and bizarre, sideways-facing handprints.

Once thought to be exclusively fish-eating, modern analyses suggest that different pterosaurs specialised in eating specific foodstuffs, including small vertebrates, animal carcasses, fruits, shellfish, plankton and insects.

Mark Witton is a pterosaur researcher at the University of Portsmouth.

Mark Witton explains how he became a scientist and artist

I've been a keen artist from the time when I could hold a pencil, but have almost always felt that science, and particularly palaeontology, was the way I needed to head professionally. As such, I gave up Art lessons at the age of 16 and, instead, trained in biology and palaeontology. However, my artistic hobbies seem to have followed me through the science door and, if I have any name for myself at all, it's as a guy who conducts and then illustrates his own research on flying reptiles.

On the back page, Mark describes how flying reptiles took over London's Southbank Centre.



Fossils show that pterosaurs were predated or scavenged by other animals. Here, an 8 m span azhdarchid pterosaur is being scavenged by groups of Velociraptor-like dinosaurs, birds and another pterosaur.

Look here!

A blog put together by pterosaur researchers and artists: pterosaur.net

The University of Portsmouth is one of Britain's leading pterosaur research labs: www.port.ac.uk/pterosaurs

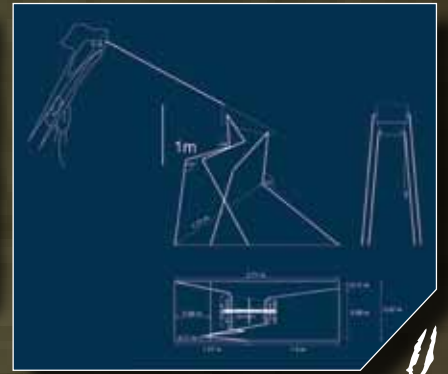
An excellent book: *The Pterosaurs from Deep Time* by pterosaur guru David Unwin (2005, Pi Press)

BUILDING PTEROSAURS

In June 2010, the Portsmouth University pterosaur research team showed their life-size model pterosaurs at the Royal Society Exhibition at London's Southbank Centre.



Start with a pterosaur fossil - it's not much to go on



Sketch the bone structure - look for muscle attachment sites



Build a skeleton of steel, or aluminium for a 'flying' model, and clad with Styrofoam muscles



Cover with metal mesh and fibreglass; add fibreglass wings and a layer of fur to the head and neck



It took a team of over a dozen people all night to install the models in their temporary home