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Page 1: Humans find the panda's soulful gaze irresistible.

Pages 2–3 and 4–5: It is a privilege to watch the panda going about its business in its natural habitat.

Opposite: The black-and-white panda stands out against the green of its surroundings.

INTRODUCTION

IAIN VALENTINE

THERE IS NO OTHER ANIMAL, as far as I know, that elicits such overwhelmingly positive responses in humans as the giant panda, whether in real, live encounters or simply from photographs.

Yet despite the massive public following that giant pandas have both in and outside China, this endearing animal is still very much a mystery to us in terms of its biology and how it lives in its natural habitat: the mountains of southwestern China. And, of course, it is still a gravely threatened species, with a population in the wild of only around 1,500, and a further 300 in captivity globally (most of them in China).

The giant panda being such a reclusive, shy animal, as well as being a relative newcomer to the world of the scientist, few people – Western or Chinese – have ever had the privilege of observing, photographing or filming pandas in the wild.

The tireless work of Zhou Mengqi over the course of many years in studying and gathering images of giant pandas, both in the wild and in captivity, is as impressive in itself as the images he has captured for this book.

The difficulty and hardships that he will have had to endure in ensuring that he was in the right place at the right time to photograph such a rare animal, in such harsh terrain, and within such a wide area of high, mountainous bamboo woodland, are testament to his own dedication to the species.

With such stunning images available, it's only right that they are used to help paint a modern, easily understood picture of this animal, and in so doing, to help provide you, as the reader, with a greater insight into all that surrounds giant pandas.

As a symbol of a global conservation movement and as the easily identifiable ambassador and symbol of the mighty country of China, a great deal of attention has always been given to the panda – and never more so than when pairs of them are sent on loan from China to zoos in other countries.

At the time of writing this introduction, we are just weeks away from receiving Britain's first pair of giant pandas since the mid-1990s. Tian Tian, the female panda, and Yang Guang, the male, will be housed for the next ten years at the Royal Zoological Society of Scotland's Edinburgh Zoo, where they will play their own parts in helping to ensure the long-term survival of this species.

The pandas will, of course, do what pandas do, and they will do it well in Edinburgh, but importantly they come as ambassadors of China, as the country's national treasure, their loan representing a gift to the people of the UK from the People's Republic Of China. But what does this mean, and what are the opportunities for us all, beyond seeing these wonderful animals at Edinburgh Zoo?

As the world around us changes, as we get to grips with the pressures and damage that we have inflicted about ourselves and on the planet, it's apparent to all those working within the field of conservation that our own survival is inextricably linked to safeguarding and protecting biodiversity – other species and their habitats – in the world we all share. Collectively, then, humans need to work together; to understand one another, appreciate our differences, but share our common goals.

China is a nation that will undoubtedly have a major role in shaping the world's future, and so its actions will impact on us all in many ways in the years to come.

Through pandas we can learn much more about this diverse country – its people, its culture, its politics, its rich environment and wonderful biodiversity. We can learn more about China’s environmental efforts, and we can share with China our own knowledge and experiences to further our own conservation efforts here in the UK.

But what of pandas, what future do they have?

Like everything else within the field of conservation, the protection of pandas is a responsibility we all share. The Chinese government continues to allocate tremendous resources to the conservation of this species and the habitats that giant pandas occupy. In time, new reintroduction projects will be attempted in a bid to augment the wild population and to re-establish the pandas in areas in which they were once found. It’s our duty to support and encourage these efforts and all that China is doing for pandas.

I struggle to think of any other species that can motivate the human race in the way pandas can: to provoke thought and to inspire

us all to will the species on to become a resounding conservation success story.

In many ways the achievement of modern China in balancing its environmental credentials with sustainable economic development mirrors what has been happening to the panda population. The fact that the numbers of pandas appear stable – maybe even increasing in some areas – is testament to the hard work that has been dedicated to safeguarding this species for many years already.

However, with a global population of fewer than 2,000 animals, this species remains critically endangered and in a fragile state, and we cannot ignore these sobering facts.

This book is a wonderful tribute to a seriously wonderful animal. Read, enjoy the pictures, and be glad that your book has contributed to the Royal Zoological Society of Scotland’s panda fund, but make sure you do something more to help further the conservation efforts of our species for future generations.



Left and opposite: Panda cubs learn to climb from a young age.







CHAPTER ONE

PANDAMONIUM

*The giant panda is unique – and not just uniquely
cuddly or charming: there really is no other
animal like it in the natural world.*



Opposite: Pandas have flourished on the rugged slopes of Sichuan's Jiayin Mountains for millions of years. Their range once extended across much of lowland China, too.

THE PRIMITIVE PANDA

THE GIANT PANDA'S NEAREST RELATIONS ARE NOTHING LIKE AS CLOSE AS WE'VE LONG ASSUMED; they're distanced not only by genetics and geographical distribution, but by enormous differences in diet and lifestyle, too. Despite belonging to the zoological family of the *Ursidae*, or bears, giant pandas differ markedly from their relations in everything from anatomy to behaviour.

IN THE TEETH OF THE EVIDENCE

Because it has no close relatives other than its antecedents in the fossil record, the giant panda is often described as a 'living fossil'. Its ancestors are more numerous than might be expected, although fossil finds have been for the most part fragmentary, and palaeontologists have had to make their judgments on the basis of assorted skulls and jawbones, bits of bone and teeth. Yet such discoveries can be extraordinarily informative: even the find of a single tooth is by no means trivial, especially when an animal has evolved as idiosyncratically as the panda.

A scattering of teeth is just about all that we have to show for the existence of *Ailurarctos lufengensis*, or the primal panda; crucially, though, they're the crushing molars that characterise the bamboo-eating panda. Exceptionally big, and broad and flat across, these teeth equip the panda to chomp its way through many kilos of unyielding bamboo shoots each day, and clearly set it apart from other *Ursidae*. Discovered in the tropical rainforests of Yunnan, southwestern China, in the neighbourhood of the village of Lufeng (from which the primal panda derives its scientific name), the teeth of *Ailurarctos lufengensis* date back to the latter part of the Miocene period, some 8 million years ago.

A QUESTION OF SIZE

Some of the panda's proto-panda ancestors were true giants: one species, *Ailuropoda baconi*, whose fossilised remains have turned up widely in China, was significantly larger than *Ailuropoda melanoleuca*, the giant panda of today. Its area of distribution was a great deal larger, too, extending not only across the whole of southern China, but through southeast Asia – including Thailand, Vietnam and Laos – into Myanmar (Burma). Yet *Ailuropoda baconi* appears to have been too huge to thrive in the rapidly changing climatic conditions of the Pliocene era (5.3 to 1.8 million years ago). *Ailuropoda baconi* became extinct, or, rather, underwent what is known as a 'pseudo-extinction', evolving into new, and much smaller, forms.

One of these new forms, identified from an almost complete skull uncovered in the Jinyin Cave, in the Guangxi region of southern China, very closely resembled today's giant panda in all but size. *Ailuropoda microta*, the pygmy panda (or the 'pygmy giant panda', as it's sometimes logically, but confusingly, called), was about half as big as *Ailuropoda melanoleuca*. It dates back to 2 to 2.4 million years ago.

Opposite: Pandas can grip bamboo using a special pseudo-thumb.

The fossil record suggests that the panda then continued evolving, growing gradually as time went on, to reach its present bulk approximately half a million years ago.

Through all of these ups and downs in size, however, the panda remained essentially the same animal in anatomical terms, which is stranger than it may at first appear. Indeed, evolution moves in mysterious ways in the case of the panda, considering that far-reaching changes may have been expected in a mammal whose digestive system seems more or less entirely at odds with the way that it has lived through countless generations.

A CONTRARY CARNIVORE

The panda is classed as a carnivore, a member of the zoological order *Carnivora*. At the same time, however (and it's a well-known fact – indeed, one of the best-known facts that there is about the giant panda), it subsists almost entirely on bamboo, which makes up 99 per cent of its diet. From a dietary point of view, at least, this means that the panda has much more in common with grazing mammals (ruminants) than with other *Ursidae*. That said, most members of the *Ursidae* family are prepared to compromise their carnivorous habits, and only the polar bear (*Ursus maritimus*) is anything like exclusively meat-eating. Yet when the other *Ursidae* turn to plant foods, they tend to favour the more readily digested kinds, like fruit and nuts. The panda could hardly be more different in its diet, and even most specialist herbivores would struggle to extract adequate nutrition from bamboo.

Typically, mammals that eat grasses, stems and other highly fibrous foods process them a stage at a time, through a series of separate stomachs or stomach chambers. Digestion for grazing animals begins in the fore-stomach, or rumen. Here, special enzymes set about breaking down the cellulose that forms the bulk of what's been eaten. Cows famously chew the cud, part-digesting grass in a fore-stomach before bringing it back into the mouth to chew again, gradually reducing it to a form in which it can be properly digested and its nutrients extracted. Sheep and goats do the same, as do a great many other wild ruminants: everything from antelope and deer through buffalo and bison to giraffes.

The giant panda has no such sophisticated digestive equipment. It just has the straightforward single stomach of its carnivore ancestors,

even though the cellulose-rich bamboo that it eats is even tougher than grass (bamboo is more like wood in texture). Granted, the panda's digestive system is robustly engineered for physical toughness, the inside of its mouth and throat being as durable as seasoned leather, providing protection from injury as the tough bamboo is swallowed. The bamboo's passage is eased, too, by the secretion of copious amounts of lubricating mucus in the panda's gut. The stomach is also very strong, its thick walls being resistant to splinters. Nevertheless, it is a single, simple stomach that has no special enzymes to assist in the processing of so much cellulose; instead, it relies entirely on its own acid.

RULE OF THUMB

One evolutionary anatomical adaptation that has reflected the panda's lifestyle is the development of a thumb, allowing it to hold on to springy bamboo stalks as it chews. Strictly speaking, this appendage isn't really a thumb – it's an unusual outgrowth of bone and tendon – but it takes on some of the functions that a primate's thumb performs.

The panda's 'thumb' is actually what is known as a sesamoid bone: rather than belonging structurally to the skeleton, it is embedded within a tendon, giving it resilience, whilst allowing it to move freely. Such bones are typically to be found at the body's joints, where flexibility is needed, but strength has to be maintained at the same time. (The human patella, or kneecap, is an example; so, too, are the metatarsals that govern the movement of the toes.)

In the giant panda, an elongated sesamoid bone branches out to one side of the paw, beside the digits proper. This would have helped the panda's ancestors to articulate the wrist. It has evolved – and grown – a long way since then, however: although it has reduced movement, it now works as an opposable thumb (like the human one), providing an anchoring point against which clutching claws can hold a bamboo stem or other objects.

