

Giraffe
(Giraffa camelopardalis)

Preface

While it may be impossible to photograph evolution per se, we may certainly photograph its results. Many famous products of evolution emerged independently across wildly different species, but nevertheless share functional or morphological features – often for very interesting reasons. Hence, a focus on specific organs or bodily parts is often especially useful, leading to additional, fascinating insights that a broader view would have missed. This book is a cooperation between an evolutionary biologist and a mathematician who also happens to be a passionate nature photographer. We aim to illuminate the vast field of evolutionary biology, wielding images and text with equal importance.

The majority of photographs were taken by *Georg Glaeser*, who aimed to depict the numerous animals with empathy and artistic grace, rather than with dispassionate scientific objectivity. The images on this spread are a good example of his approach – details emerge spontaneously at the expense of „zoological clarity“, allowing even seasoned biologists to notice remarkable features or patterns of behaviour that would be missed on purely scientific images.

As a species, we rely disproportionately on our eyesight – a predilection that makes us prone to judging by appearance. Sea horses and giraffes may be extremely different animals, and yet, one would be hard-pressed to deny a superficial resemblance beyond the mere difference in size. Some even conclude, on the basis of appearance alone, that humans have fish-like ancestors – but looks may be deceiving, and our naive intuitions are often mistaken. Incidentally, evolutionary biology has already settled the question of what caused the giraffe‘s famous neck to grow so long: it did not evolve, as it is often believed, because the animals fed on trees that grew their foliage on increasingly higher branches in a desperate arms race to survive in the African savanna. Rather, their necks seem to have been molded by the ubiquitous mechanism of sexual selection.

In writing this book, we have attempted to give many examples along the various branches of the evolutionary tree. Our special focus always lies on the ways in which eyes have evolved. We have attempted to illuminate this gradual development from many perspectives, comparing the many strikingly different results of this billion-year process through



Tarsier *(Tarsius spec.)*

pictures and schematic illustrations. Since photographs play such an important part, the textual descriptions have been condensed to their essence. However, we have attempted to provide a broad scope of additional information through footnotes and related publications, including websites. This book is accompanied by a website of its own, where changes to the referenced websites are tracked and remedied whenever possible.

This book does not have to be read from front to back – in fact, it encourages a "coffee table" style of reading. However, we have tried to make jumping from chapter to chapter easier by including an extended glossary towards the end, which contains explanations of the most important terms, followed by an index for situations when even the glossary does not suffice.

We aim to present the staggering diversity of eyes in the animal kingdom – from stalk eyes to point eyes, facet eyes, and lens eyes. The simplest form of eyes already appears in single-celled organisms, which may possess a photoreceptor at the base of their flagellum, which allows them to distinguish dark from light. However, it is remarkable to notice that eyes are largely irrelevant to forms of life that do not possess a clear anterior (head, eyes, and feeding tools) and posterior (organs of excretion).

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Due to the limited number of pages available to us, we have had to select the printed photographs very carefully. Many interesting pictures didn't make the cut, but can still be found on this book's official website: www.uni-ak.ac.at/evolution

Western long-tailed hermit *(Phaethornis longirostris)*

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