



How Birds Fly: The Science and Art of Avian Flight

Peter Cavanagh

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Peter Cavanagh's *How Birds Fly* is an enlightening examination of the aerodynamics of bird flight.

A rare science book that includes dazzling photographs of birds from around the globe, including hummingbirds, songbirds, raptors, and waterbirds, this text is illuminative and descriptive. Its chapters cover the full range of bird flight, including the “rules” for lifting and landing, perching, soaring, flapping, hovering, navigating, changing direction, and migrating. In an intriguing summary of the physics of avian aerodynamics, it explains that the subtle interactions between a bird's flapping wings and the surrounding air are a “deeply complex mathematical puzzle.”

The book's depictions of bird anatomy yield insights, as with those regarding birds' dense bones, which include noncircular cross sections that add strength; elsewhere, the book reveals that birds' breathing systems are different from those found in mammals, involving air sacs that control airflow and “pneumatic” bones. Boxed features summarize the leading research, as with an examination of whether water birds use an internal compass to land along the geomagnetic north-south axis. Also discussed are theories about how and why birds evolved the ability to fly and why some birds, including kiwis and penguins, are flightless.

There are hundreds of breathtaking photographs that use color and composition to highlight views of avian behavior, including the startling wingspan of a Gray-Crowned Crane, the prehistoric visage of the Hoatzin, and the braking wing beat of a Black-billed Mountain Toucan maneuvering to land. Dozens of instructive illustrations further inform and clarify the book's scientific descriptions of avian biomechanics and anatomy. Discussions of the principles of human flight round the book out, with profiles of the Wright brothers and other pioneers in the study of aviation.

Impressive in its scope and beauty, *How Birds Fly* is a luminous study of the phenomenon of avian flight.

KRISTEN RABE (September / October 2024)

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