Faculty Articles

New Flying Robots Take Cues From Airborne Animals

From navigating turbulence, to sleeping mid-flight, to soaring without a sound, animals' flight adaptations are helping scientists design better flying robots. This special issue is intended "to inspire development of new aerial robots and to show the current status of animal flight studies" Though humans have been building flying machines since the 18th century, these new studies revealed that there is still much to be learned from looking closely at how birds, insects and bats take flight, keep themselves aloft and manoeuvre to safe landings. But improving how these robots fly isn't easy, experts said. Fortunately, there are plenty of flying animals that scientists can turn to for inspiration. About 10,000 species of birds; 4,000 species of bats; and well over 1 million insect species have evolved over millions of years to spread their wings and take to the air, and most of these species' flight adaptations haven't been studied at all.

Most people think that since we know how to design airplanes, we know all there is to know about flight. But once humans could successfully design planes and rockets, they stopped looking as closely at flying animals as they had in the past. Now, however, growing demand for small, maneuverable flying robots that can perform a variety of tasks has sparked a scientific "renaissance" and is driving researchers to investigate many open questions about animal aerodynamics and biology .

For example, how are owls able to fly so silently? One team of scientists explored adaptations in owls' wings that could muffle noise, finding that the animals' large wing size and the wings' shape, texture and strategically placed feather fringes all work together to help owls glide soundlessly.

Image of the AquaMAV flying robot diving into water, next to an image of a northern gannet (Morusbassanus), also diving into water.

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Another group of researchers wondered how frigate birds — a type of seabird that can fly without stopping for days at a time — could sleep "on the wing" during long migrations.
The scientists collected the first recordings of in-flight brain activity for these birds, discovering that the animals were able to "micro nap" to rest both brain hemispheres at the same time..

A morphing wing, inspired by bird feathers, can fold and unfold rapidly

Some scientists puzzled over how fruit flies were able to stay aloft even if their wings were damaged, learning that the insects compensated for missing pieces in wing membranes by adjusting their wing and body movements, enabling the bugs to fly even if half a wing had been lost .

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"Thousands of candles can be lighted from a single candle, and the life of the candle will not be shortened. Happiness never decreases by being shared." Buddha