

The Physics of Cats

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Patricia E. Allen, Appalachian State Univ

This is a credit course at Appalachian State.

It takes a temperature of about 125 F to drive a cat away. A cat will use its body position to control the area exposed to the sun. It can fluff its fur to control the amount of trapped air. Licking helps with cooling. Older cats do not lick as much.

The tyrosinase enzyme controls coloration and pigmentation. A low percentage results in a white cat. The absence results in a white, deaf cat.

Some genes can have an effect on multiple traits. This is known as pleiotropy.

EEG patterns are similar for sleeping humans and cats. Adenosine is the chemical responsible for sleep. EMG patterns are also useful for studying brain waves.

Cats eyes contain layers of guanine, up to 15, which are green-yellow, iridescent crystals, on the inner lining of the eye. This is called the tapidum lucidum, and is responsible for the reflective nature of cat's eyes. It is unknown whether cats can see any colours. Colour and detail are unimportant to a cat. Motion is most relevant. The rods are distributed for sensitivity, not for detail. Cats enjoy 130° of binocular vision, versus 120° for humans. Judging distance is important for jumping.

First Law of Cat Gravity: all cats are exempt from the normal laws of gravity.

High Rise Syndrome: Feline Pesemetology. According to a study by Whitney and Mehloff, of 115 cats that fell 2-32 stories, 104 survived. In falls of 2-7 stories, 10% died. However, in falls over 7 stories, only 5% died. Cats appear to take the "flying squirrel" approach towards falling, controlling their terminal velocity with the shape of the body. After 5 stories, cats stabilized at a terminal velocity of 60 mi/h, compared to 120 mi/h for humans. Most mammals can withstand a compressive force of $\sim 170 \text{ MN/m}^2$. A falling cat experiences an average impact force of about 10 000 N, must lower than a falling human. This may be due partially to the longer impact time for a cat, which tends to strike front paws, then shoulder, then spine, then tail. Injuries are typically to chin and chest. The cat behaves much as a critically-damped oscillator. A good video segment is the falling cat, in slow motion, in the film Milo and Otis.

Gordon Ramsey, Loyola Univ. Chicago

The record life span for a cat is 32 years. Most cats live 10-15 years.

Large and small cats have parallel behaviours.

Cats need a cup of protein and 1/16th of their weight in fresh water each day.

Cats hear up to 65 kHz.

Sir Isaac Newton invented the cat door.

Heartbeat 110-140 bpm, body temperature 101.5F, 290 bones, most in the spine and tail.

Nose pad is ridged in a unique pattern similar to human fingerprints.

J. Ronald Galli, Weber State Univ

Ron Galli has studied the physics of the cat twist. He has built several spring models of cats to demonstrate how cats can rotate in mid-air without violating conservation of angular momentum. See Scientific American, March 1980, the Physics Teacher Sept 1995.

Cats are 40% left-pawed.

More information at <http://www.nhm.org/cats> and <http://www.lookd.com/cats/anatomy.html>.

Dropping a robot cat
to watch the cat twist.



Primitive robot cat
next to more
sophisticated android
cat.

