Newsletter of
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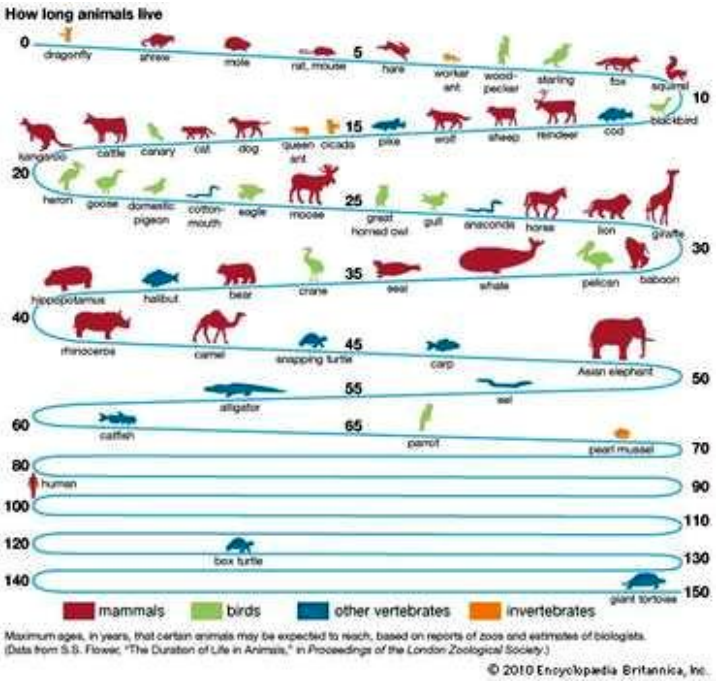
Life spans of different animals

Lifespans of animals

What is the relationship between the size of an animal and how long it lives? This interesting topic raises lots of questions, many quite pertinent to our modern lives. It begs for a bit of mathematical scaffolding.



We are going to

- look at how long different species tend to live
- summarize various theories that have been proposed over time to explain the differences
- try to figure out which mammal lives the longest.

in this issue of Sound of Science.

Big things live longer?

Animal size does not necessarily indicate life span. The wild lion's age compares with that of a domestic cat; larger breeds of dogs have shorter life spans than smaller ones; and a Shetland pony can outlive a regular horse. However, larger animals, as a rule, do live longer in the wild than smaller ones. One reason for this is that more dangers face the smaller creatures. Rising waters from a heavy rain can drown a small creature or destroy its home and food supply while only causing the

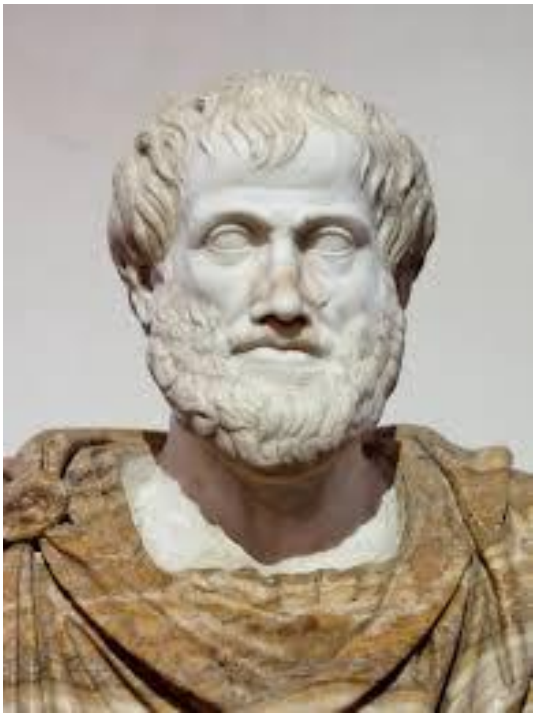
larger animal to get wet or be uncomfortable. Predators also feed heavily on the smaller animals such as rabbits, mice, birds, and insects. So you can see there is a certain amount of safety that comes with size.

The following table list out the life spans of some species of animals.

Animals	Average Life Span (in years)	Animals	Average Life Span (in years)
Bat (Guano)	15	Dog (Domestic)	20
Bear (Grizzly)	34	Donkey	50
Buffalo	45	Dove	12
Cat (Domestic)	30	Garter Snake	6
Chimpanzee	50	Gila Monster	20
Crocodile	13.5	Giraffe	28
Deer (Mule)	20	Goat	10
Guinea Pig	5	Horse	35
King Snake	14.5	Lion	35

Aristotle's explanation

The link between size and lifespan was first remarked on by Aristotle (350 BC). He made a connection between fire and life which was interestingly prescient:



'*A lesser flame is consumed by a greater one, for the nutriment, to wit the smoke, which the former takes a long period to expend is used up by the big flame quickly.*' – Aristotle

He argued that ageing and death were linked to the process of dehydration. For a long time, Aristotle's explanation was accepted. However in the 1800s, people began to think of ageing more as a result of 'wearing out' the body.

The rate of living theory

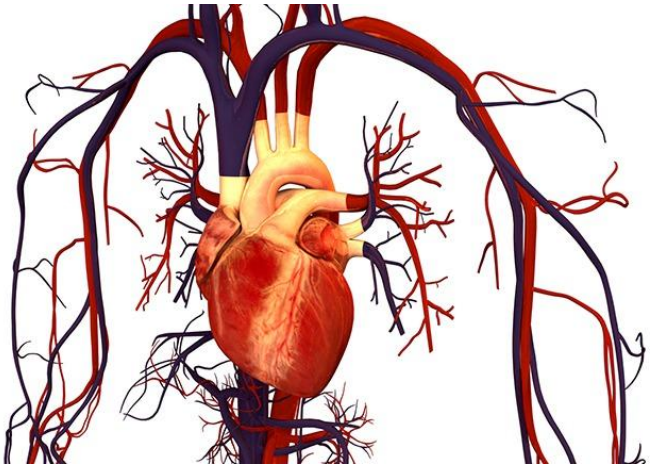
In 1908 Max Rubner studied the energy metabolism and lifespans of five domestic animals: guinea pig, cat, dog, cow and horse, as well as man. The larger animals lived longer, and he observed that while the total metabolic rate of these animals increases with mass, it did so at a slower rate than mass (so a 50005000 kg elephant will use less energy than 50005000 kg of mice).

However it was also noticed that the product of energy expenditure by maximum lifespan was relatively independent of body size (with humans excluded from the comparison). So a gram of body tissue expends about the same amount of energy, over a lifetime, independent of whether the tissue is in a guinea pig, cat, dog, cow or horse.

The consequent idea that using energy up faster will hasten death is the 'rate of living' theory. In his 1922 book 'The Biology of Death', Raymond Pearl argued that genetic constitution and the rate of energy expenditure were the key factors in life expectancy. He observed that if accidents were excluded from the statistics, the rates at which males died after the age of 45 were directly related to the levels of energy expenditure in their occupations.

However more recent experiments involving birds have cast some doubt on the universality of this thesis: lifetime expenditures of energy per gram of bird tissue are on average substantially greater than the equivalent values in mammals.

A billion heartbeats



Remarkably, biologists have discovered that on average most animals have a lifetime allocation of about a billion heartbeats. We might say that an elephant lives longer than a mouse because its heart beats slower, and so the elephant has more time to get its billion beats. But very possibly the increased metabolic rate of the mouse means that it is doing more living in any given day! There seems to be some glimmer of fairness in this idea.

COMIC CORNER

RELAXING ZONE

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Daily SuDoku: Tue 30-Apr-2019 easy

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9	2	8	5	4	3	7	6	1
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1	5	3	9	7	6	2	4	8

Daily SuDoku: Tue 30-Apr-2019 easy

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