

1.2 Movement, Locomotion

Table 1.2.0: Numbers that Amaze

This table brings together several interesting figures from Sect. 1.2, which are cited again in the individual tables below, where they are accompanied by references to the literature.

Number of wingbeats per second in insects		
	Chironomidae (<i>Forcipomyia</i>)	1,046/s
	Housefly	up to 330/s
Number of wingbeats in birds		
	Amethyst hummingbird	78/s
	House sparrow	13/s
	Pelican	1.3/s
Wing surface areas in birds		
	GriFFon vulture	10,450 cm ²
	Ruby-throated hummingbird	10 cm ²
Greatest surface load in birds		
	Mute swan	167 N/m ²
	Albatross	155 N/m ²
Maximum speed, swimming		
	Swordfish	90 km/h
	Marlin	80 km/h
	Orca	65 km/h
Maximum speed, running		
	Cheetah	120 km/h
	Greyhound	110 km/h
	Red kangaroo	80 km/h
Maximum speed, flying		
	Common swift	180 km/h
	Spine-tailed swift	335 km/h
	Peregrine falcon, in a swoop	290 km/h
Maximum speed, during bird migration		
	Common swift	150 km/h
Annual migratory flight distance		
	Arctic tern	40,000 km
	Stork	20,000 km
Maximum jumping distance in animals		
	Red kangaroo	13.5 m
		= 9 times its body length
	Flea	60 cm
		= 200 times its body length

Table 1.8.4: Oxygen Consumption of Selected Animals

Figures in grams oxygen per kilogram body weight and hour. One gram of oxygen (O₂) corresponds to approx. 700 cm³. See also Table 1.4 and the comments found there on the relationship between oxygen consumption and body size.
Listed in systematic order.

Figures from SCHLIEPER 1952, VANGEROW 1975

Taxon, species	Body weight		Oxygen consumption (g O ₂ per kg and h)
Paramecium	0.001	mg	0.7
Radiolaria (Protozoa)	0.1	mg	0.1
Cnidaria	10–100	g	0.004–0.02
Mussels	25–250	g	0.002–0.03
Snails	20–50	g	0.01 –0.1
Cephalopods	10	g	0.6 –0.32
Segmented worms (annelids)	1–20	g	0.03 –0.7
Crustaceans	5–500	g	0.04 –0.28
Echinoderms	10–600	g	0.018–0.04
Carp	200	g	0.08 –0.3
Pike	200	g	0.49
Frog	30	g	0.03 –0.09
			max. 0.63
Reptiles	30	g	0.02 –0.03
Chicken	2	kg	0.79 –1.1
Mouse (resting)	20	g	3.5
(running)			28
Rat (resting)	110	g	2.4
Dog (resting)	9	kg	0.72
Horse	400	kg	0.3
Human (resting)	70	kg	0.28
(working)			5.6

Table 1.8.5: Oxygen Consumption During Hibernation of Selected European Mammals

Figures represent oxygen consumption in cubic centimeters oxygen (O₂) per kilogram body weight (BW) and hour. For figures for nonhibernating animals, see Table 1.8.4. On hibernation, see also Table 1.4.5.

Data after ALTMAN and DITTMER 1972

Species	Oxygen consumption (cm ³ O ₂ per kg BW and per hour)
Common pipistrelle	53
European ground squirrel (suslik)	15

(Cont.) →

Species	Oxygen consumption (cm ³ O ₂ per kg BW and per hour)
Fat dormouse	17–29
Giant noctule	30
Hamster	32
Hazel dormouse	40
Hedgehog	28
Long-eared bat	69
Marmot	18
Myotis (bat)	20

Table 1.8.6: Maximum Diving Depth and Diving Time of Air-Breathing Vertebrates

Figures from BRINK 1975, FRÄDRICH and FRÄDRICH 1973, GRZIMEK 1970, KRUMBIEGEL 1953, *Nat. Rdsch.*, NIETHAMMER 1979, PENZLIN 1970, SCHÄFER 1968, WOOD 1982, ZISWILER 1976

Species	Maximum diving time	Maximum depth
Alligator	120 min	
Beaked whale	120 min (!)	500 m
Beaver	15 min	
Blue whale	30 min	200 m
Bowhead whale	80 min	1,000 m
Common or Harbor seal	15 min	
Duck	15 min	
Elephant seal	30 min	100 m
Gray seal	18 min	146 m
Great cormorant	5 min	40 m
Great crested grebe	56 s	40 m
Guillemot	12 min	
Harbor porpoise		170 m
Hippopotamus	19 min	
Human	2 min	72 m
Leatherback turtle		1,200 m (!)
Loon	15 min	75 m
Muskrat	12 min	
Northern gannet		10 m
Penguins		60 m
Platypus	12 min	
Polar bear	2 min	
Sea otter		50 m
Sirenia (“sea cows”)	10 min	
Sperm whale	75 min	1,143 m
Walrus	10 min	30 m
Weddell seal	43 min	600 m

2.1 General Data: Dimensions, Age, etc.

Table 2.1.0: Numbers that Amaze

This table brings together several interesting figures from Part 2, which are cited again in the individual tables below, where they are accompanied by references to the literature.

Highest known age in a tree	Redwood (sequoia)	4,000 years
	Bristlecone pine	4,600 years
Root depth	Grape vine	12–16 m
	Desert plants (max.)	20 m
Speed of growth	Bamboo shoots	57 cm/day
	Banana leaf sheaths	160 cm/day
Single leaf with the greatest surface area	<i>Victoria regia</i> (max.)	2 m ²
Beech tree has an overall leaf surface area of up to		446 m ²
Water vessel diameter in	Lianas (max.)	700 μm
This allows a water conductance speed of up to		150 m/h
Heaviest wood	Guaiacum (or lignum vitae)	1.23 g/ cm ³
Lightest wood	Balsa wood	0.18 g/cm ³
Tallest tree	Australian mountain ash (<i>Eucalyptus regnans</i>)	152 m
Tree with the greatest trunk diameter	Baobab	15 m
Tree with the greatest trunk circumference	Baobab	47 m
Longest blooming period of a single blossom	<i>Odontoglossum rossii</i>	80 days
Blossom diameter	<i>Rafflesia arnoldii</i>	1 m
Number of seeds per tree	Birch	30,000,000
Number of seeds per capsule	Swan orchid	3,751,000
Seed weight	Broomrape	0.000001 g
	Avocado	60 g
Ballistic fruits catapult their seeds	Liana <i>Bauhinia purpurea</i>	15 m
	Lupin	7 m
Osmotic pressure in cell liquid	Common glasswort	113 atm
	Sod (<i>Suaeda</i>)	130 atm

Table 2.3.2: Germination Speed of the Seed of Selected Useful Plants

Figures given represent the number of hours until the radicles become visible. Since this is highly temperature dependent, values are provided for 10, 15, and 25 °C.

After MEYER 1964

	10 °C	15 °C	25 °C
Alfalfa	90	66	48
Barley	72	48	72
Carrot	162	102	56
Corn (maize)	272	78	56
Cucumber	–	–	96
Oats	90	66	48
Pea	72	42	–
Poppy (genus)	114	60	48
Pumpkin	–	258	52
Rape	48	24	24
Red clover	72	42	24
Rye	54	30	32
Sunflower	600	72	32
Wheat	84	48	33

Table 2.3.3: Vernalization Temperatures and Periods of Selected Plants

Vernalization is defined as the temporary effect of low temperatures on seeds or plants in initiating the flowering process. In many useful plants, there are great differences between individual varieties.

Figures after various authors in ALTMAN and DITTMER 1973

Species and plant part	Period (days)	Optimal temperature (°C)
Bean, seeds	30–35	2
Beet, plants	30–50	0–2
Beet, seeds	80	0–5
Cabbage, seeds	28	0
Carrot, plants	40–65	4
Cauliflower, plants	14	5
Celery, plants	15–30	4,5–10
Common evening primrose, seeds	30	4
Corn (maize), seeds	34	3
Crimson clover, seeds	40	0
<i>Dactylis glomerata</i> , plants	30–90	0–2
Endive, seeds	28	1–2.5

Species and plant part	Period (days)	Optimal temperature (°C)
<i>Festuca elatior</i> , plants	30–90	0–2
Kohlrabi, plants	60–90	5
Lentil, seeds	10–12	6 –10
Lettuce, seeds	10–20	2 – 5
<i>Lolium perenne</i> , seeds	0–90	0 – 5
Lupin, seeds	14–21	2 – 5
Oats, seeds	30–45	0–2
Opium poppy, seeds	35	2 – 3
Pea, seeds	20–30	2–7
Radish, seeds	10–46	0 – 5
Spinach, seeds	10–15	2 – 8
Spring barley, seeds	0–15	6 – 8
Spring rye, seeds	0–14	0 – 5
Spring wheat, seeds	0–14	0 – 8
Sunflower, seeds	35	2
Sweet william, plants	42–63	5
<i>Trifolium pratense</i> , seeds	10–40	3 – 8
White mustard, seeds	10–30	0 – 3
Winter barley, seeds	20–40	0 – 3
Winter rye, seeds	30–50	0 – 5
Winter wheat, seeds	40–70	0 – 3

Table 2.3.4: Growth Speed of Selected Plant Organs Under Optimal Conditions

The growth of plants is heavily temperature dependent; on this see Table 2.3.11. Most plants grow at a speed of less than 0.005 mm/min.

Figures after MEYER 1964, OPPENHEIMER and PINCUSSEN 1929

Plant species and organ	Growth speed
Asparagus, shoot	0.08 mm/min = 11.1 cm/day
Autumn crocus, pollen tubes	0.015 mm/min = 2.16 cm/day
Bamboo, shoot	0.4 mm/min = 57 cm/day
Banana, leaf sheath	1.1 mm/min = 160 cm/day
Broad bean, radicle	0.012 mm/min = 1.7 cm/day
Bryony, shoot	0.056 mm/min = 8 cm/day
Hemp, sprout	0.05 mm/min = 7.2 cm/day
Ink cap, fruiting body stalk	0.22 mm/min = 31.4 cm/day
Mold (<i>Mucor</i>), hyphae	0.026 mm/min = 3.74 cm/day
Oats, coleoptile	0.025 mm/min = 3.7 cm/day
Pea, root	0.02 mm/min = 2.88 cm/day

(Cont.) →

Table 4.5.9: Adult Daily Requirements of Essential Amino Acids

See also Table 4.5.4.

After *Documenta Geigy* 1975, KARLSON 1974

Amino acid	Absolute amount (g)		mmol/kg body weight
	Males	Females	
Valine	0.80	0.65	0.28
Leucine	1.10	0.62	0.39
Isoleucine	0.70	0.45	0.21
Lysine	0.80	0.50	0.24
Phenylalanine	0.30	0.22	0.18
Tryptophan	0.25	0.16	0.04
Methionine	0.20	0.35	0.07
Threonine	0.50	0.31	0.20

Table 4.5.10: Fatty Acid and Cholesterol Content of Selected Foodstuffs

Unsaturated fatty acids cannot be synthesized by the body and thus must be ingested. The most important of these essential fatty acids is linoleic acid.

Unless otherwise noted, figures are per 100 g.

Data after *Verbraucherdienst* 1979

Foodstuff	Fatty acids, polysaturated (g)	Fatty acids, polyunsaturated (g)	Cholesterol (mg)
Beef, lean	5	2	100
Pork, lean	5	1	90
Venison	1	1	110
Roast chicken	3	1	53
Duck	12	8	75
Brains	4	1	3,146
Kidney	4	1	350
Liver	4	3	250
Ham	20	4	400
Liverwurst	15	5	85
Trout	1	1	70
Herring	3	3	80
Lard	41	10	100
Butter	52	2	230

(Cont.) →



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