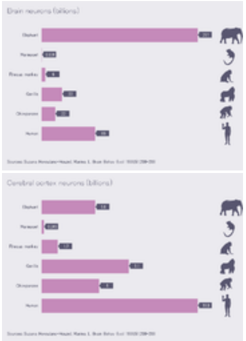
List of animals by number of neurons

The following are two lists of animals ordered by the size of their nervous system. The first list shows number of neurons in their entire nervous system. The second list shows the number of neurons in the structure that has been found to be representative of animal intelligence.[1] The human brain contains 86 billion neurons, with 16 billion neurons in the cerebral cortex.[2][1]



Brief comparisons of number of whole brain neurons (top) and cerebral cortex neurons (bottom) among six mammals.

Neuron counts constitute an important source of insight on the topic of neuroscience and intelligence: the question of how the evolution of a set of components and parameters (~10^{11} neurons, ~10^{14} synapses) of a complex system leads to the phenomenon of intelligence.[3]

Overview

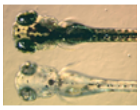
Neurons are the cells that transmit information in an animal's nervous system so that it can sense stimuli from its environment and behave accordingly. Not all animals have neurons; *Trichoplax* and sponges lack nerve cells altogether.

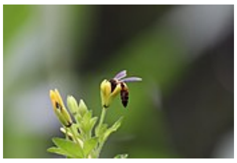
Neurons may be packed to form structures such as the brain of vertebrates or the neural ganglions of insects.

The number of neurons and their relative abundance in different parts of the brain is a determinant of neural function and, consequently, of behavior.

Whole nervous system

All numbers for neurons (except Caenorhabditis and Ciona), and all numbers for synapses (except Ciona) are estimations.

Name	Neurons in the brain & whole nervous system	Synapses	Details	Image	Source
Sponge	0				[4]
Trichoplax	0		Despite no nervous system, it exhibits coordinated feeding and response behaviors.[5]		[6]
Asplanchna brightwellii (rotifer)	~200		Brain only		[7]
Tardigrade	~200		Brain only		[8]
***Ciona intestinalis* larva** (sea squirt)	231	8,617 (central nervous system only)			[9] [10]
Caenorhabditis elegans (roundworm)	302	~7,500	First organism with its whole connectome (neuronal "wiring diagram") completed.[11][12][13]		[14]
Starfish	~500		ring of neurons surrounding the mouth		
Hydra vulgaris (fresh-water polyp)	5,600				[15]
Megaphragma mymaripenne	7,400				[16]
Box jellyfish	8,700–17,500		Adult *Tripedalia cystophora* (8 mm diameter) Does not include 1000 neurons in each of the four rhopalia		[17]
Medicinal leech	10,000				[18]
Pond snail	11,000				[19]
Sea slug	18,000				[20]
Amphioxus	20,000		central nervous system only		[21] [22]
Larval zebrafish	100,000				[23]

Fruit fly	150,000		Another organism with the connectome mapped, 139,255 neurons in the female brain[24] and ~150,000 neurons in the ventral nerve cord.		[25][26][27]
Wandering spider	100,000				[28]
Calliopsis (bee)	234,000				[29]
Ant	250,000		Varies per species		[30]
Perdita (bee)	275,000				[29]
Melissodes	495,000				[29]
Bombus impatiens	557,000				[29]
Western honey bee	613,000				[29]
Honey bee	960,000	$\sim 1 \times 10^9$			[31]
Cockroach	1,000,000				[32]
Coconut crab	>1,000,000		c. 1,000,000 interneurons are dedicated to analysing olfactory input alone.		[33]
California carpenter bee	1,180,000				[29]
Steudner's dwarf gecko	1,771,000				[34]
Brown anole	2,792,000				[34]
Mochlus sundevallii	3,049,000				[34]

Peloponnese slowworm	3,713,000				[34]
Common house gecko	3,988,000				[34]
Takydromus sexlineatus	4,021,000				[34]
Anolis cristatellus	4,270,000				[35]
Papua snake lizard	4,271,000				[34]
Guppy	4,300,000				[36]
Natal Midlands dwarf chameleon	4,305,000				[34]
Acontias percivali	4,340,000				[34]
Sand lizard	4,341,000				[34]
Ocelot gecko	4,420,000				[37]
Darevskia raddei	4,765,000				[34]
Anolis evermanni	4,920,000				[35]
Echis carinatus	4,951,000				[34]
Cerastes cerastes	4,996,000				[34]
Tenerife gecko	5,001,000				[34]

Draco sumatranus	5,174,000				[34]
Blue-throated keeled lizard	5,269,000				[34]
Crested gecko	5,417,000				[34]
Lacerta strigata	5,529,000				[34]
San Francisco garter snake	5,663,000				[34]
Red-eyed crocodile skink	5,697,000				[34]
Emoia cyanura	5,733,000				[34]
East African spiny-tailed lizard	5,756,000				[34]
Chalcides ocellatus	5,774,000				[34]
Cylindrophis ruffus	5,779,000				[34]
Cat gecko	5,964,000				[34]
Aspidoscelis deppii	5,968,000				[34]
Brown water snake	5,995,000				[34]

Aspidelaps lubricus	6,020,000				[34]
Scincus scincus	6,284,000				[34]
Montivipera xanthina	6,677,000				[34]
Hispaniolan curlytail lizard	7,063,000				[34]
Sceloporus malachiticus	7,149,000				[34]
Crotalus durissus	7,263,000				[34]
Agama agama	7,455,000				[34]
Agama aculeata	7,631,000				[34]
Gekko kuhli	7,659,000				[34]
Leopard gecko	8,081,000				[34]
Latastia longicaudata	8,099,000				[34]
Razor-backed musk turtle	8,389,000				[34]
Greek tortoise	8,520,000				[34]

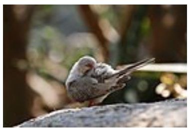
Phelsuma grandis	8,623,000				[34]
Acanthocercus atricollis	8,650,000				[34]
Tokay gecko	8,892,000				[34]
Russian tortoise	9,008,000				[34]
Marginated tortoise	9,074,000				[34]
Psammophis elegans	9,170,000				[34]
Xenopeltis unicolor	9,293,000				[34]
Zonosaurus Karsteni	9,538,000				[34]
Oplurus quadrimaculatus	9,565,000				[34]
Malagasy giant chameleon	9,751,000				[34]
Ahaetulla prasina	9,767,000				[34]
Dasia olivacea	9,785,000				[34]
Adult zebrafish	~10,000,000		cells (neurons + other)		[38]
Timon tangitanus	10,619,000				[34]

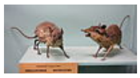
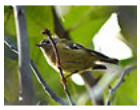
Corn snake	10,629,000				[34]
Acanthosaura capra	10,724,000				[34]
Gallotia galloti	10,903,000				[34]
Eutropis multifasciata	10,944,000				[34]
Rainbow boa	11,083,000				[34]
East African black mud turtle	11,285,000				[34]
Indochinese spitting cobra	11,306,000				[34]
Cyrtodactylus irianjayaensis	11,415,000				[34]
Uromastyx ornata	11,438,000				[34]
Yellow-throated plated lizard	11,847,000				[34]
Meller's chameleon	12,035,000				[34]
Twist-necked turtle	12,171,000				[34]
Western whiptail	12,269,000				[34]

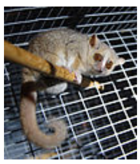
Gehyra vorax	12,388,000				[34]
White-lipped mud turtle	12,671,000				[34]
Painted wood turtle	12,677,000				[34]
Sheltopusik	12,830,000				[34]
Standing's day gecko	13,223,000				[34]
Common snapping turtle	13,681,000				[34]
Painted turtle	14,302,000				[34]
Ocellated lizard	14,593,000				[34]
Oplurus cuvieri	14,627,000				[34]
African spurred tortoise	14,986,000				[34]
Boa imperator	15,194,000				[34]
Red-eared slider	15,388,000				[34]
Plumed basilisk	15,536,000				[34]
Red-bellied short-necked turtle	15,787,000				[34]

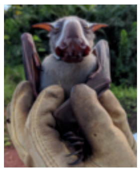
Frog	16,000,000				[39]
Corallus hortulana	16,303,000				[34]
Blue-tongued skink	16,376,000				[34]
Gran Canaria giant lizard	18,038,000				[34]
Chinese water dragon	18,301,000				[34]
Chlamydosaurus	18,641,000				[34]
Northern snake-necked turtle	19,040,000				[34]
Spiny-tailed monitor	19,771,000				[34]
Boa constrictor	19,781,000				[34]
Ameiva ameiva	19,835,000				[34]
Chinese softshell turtle	20,697,000				[34]
Amboina box turtle	21,440,000				[34]
Alligator snapping turtle	22,230,000				[34]
Yellow anaconda	23,035,000				[34]

Mexican beaded lizard	23,681,000				[34]
Major skink	24,155,000				[34]
Sudan plated lizard	24,434,000				[34]
Mata mata	26,105,000				[34]
Naked mole-rat	26,880,000				[40]
Weber's sailfin lizard	27,245,000				[34]
Green iguana	29,098,000				[34]
Argentine black and white tegu	29,251,000				[34]
Cyclura nubila	30,820,000				[34]
Gold tegu	31,335,000				[34]
Varanus macraei	33,091,000				[34]
Little free-tailed bat	35,000,000				[41]
Smoky shrew	36,000,000				[42]
Sand goanna	50,253,000				[34]

Short-tailed shrew	52,000,000				[42]
Pig-nosed turtle	53,027,000				[34]
Common bent-wing bat	56,000,000				[41]
African sheath-tailed bat	59,000,000				[41]
Hottentot golden mole	65,000,000				[43]
Woermann's bat	66,000,000				[41]
Zenker's fruit bat	66,000,000				[41]
Commerson's roundleaf bat	67,000,000				[41]
Rufous trident bat	70,000,000				[41]
House mouse	71,000,000	$\sim 1 \times 10^{12}$			[44]
Asian water monitor	78,231,000				[34]
King quail	80,478,000				[34]
Nile crocodile	80,500,000				[45]
Heart-nosed bat	81,000,000				[41]
Diamond dove	87,879,000				[34]
Golden hamster	90,000,000				[44]

Short-palated fruit bat	99,000,000				[41]
Ansell's mole-rat	103,000,000				[46]
Mashona mole-rat	113,000,000				[46]
Common quail	117,760,000				[34]
Hairy-tailed mole	124,000,000				[43]
Eastern rock elephant shrew	129,000,000				[43]
Star-nosed mole	131,000,000				[42]
Zebra finch	131,000,000		Brain only		[47]
African collared dove	139,271,000				[34]
Silvery mole-rat	148,000,000				[46]
Northern bobwhite	148,399,000				[34]
Four-toed elephant shrew	157,000,000				[43]
Eurasian blackcap	157,000,000				[47]
Wahlberg's epauletted fruit bat	162,000,000				[41]
Goldcrest	164,000,000				[47]
Cape mole-rat	170,000,000				[46]

Grey partridge	170,287,000				[34]
Egyptian fruit bat	172,000,000				[41]
Mechow's mole-rat	174,000,000				[46]
Damaraland mole-rat	178,000,000				[46]
Franquet's epauletted fruit bat	186,000,000				[41]
Brown rat	200,000,000	$\sim 4.48 \times 10^{11}$			[48]
Guyenne spiny rat	202,000,000				[43]
Eastern mole	204,000,000				[42]
Elegant crested tinamou	217,768,000				[34]
Red junglefowl	221,000,000				[47]
Great tit	226,000,000				[47]
Green-rumped parrotlet	227,000,000				[47]
Quebracho crested tinamou	235,671,000				[34]
Guinea pig	240,000,000				[44]
Chilean tinamou	241,374,000				[34]
Gray mouse lemur	254,710,000				[49]

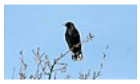
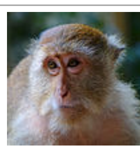
Common wood pigeon	258,681,000				[34]
Common treeshrew	261,000,000				[50]
Hammer-headed bat	275,000,000				[41]
Wood duck	305,816,000				[34]
Pigeon	310,000,000		Brain only		[47]
Budgerigar	322,000,000				[47]
Pygmy falcon	350,367,000				[34]
Cape dune mole-rat	361,000,000				[46]
Mallard	367,000,000				[34]
Eurasian teal	375,409,000				[34]
Common blackbird	379,000,000				[47]
Marbled duck	386,920,000				[34]
Reeves's pheasant	387,173,000				[34]

Eurasian sparrowhawk	401,751,000				[34]
Ferret	404,000,000				[51]
Cockatiel	453,000,000				[47]
Gray squirrel	453,660,000				[40]
Banded mongoose	454,000,000				[51]
Prairie dog	473,940,000				[40]
Red-breasted goose	482,705,000				[34]
Common starling	483,000,000				[47]
Wild turkey	492,873,000				[34]
European rabbit	494,200,000				[40]
Octopus	500,000,000				[52]
Western tree hyrax	505,000,000				[43]
Eurasian pygmy owl	533,263,000				[34]
Indian peafowl	570,934,000				[34]

Victoria crowned pigeon	578,697,000					[34]
Little owl	585,923,000					[34]
Common kestrel	624,582,000					[34]
Common marmoset	636,000,000					[50]
Eastern rosella	642,000,000					[47]
Yellow-knobbed curassow	652,989,000					[34]
Barn owl	690,000,000					[47]
Monk parakeet	697,000,000					[47]
Greylag goose	738,232,000					[34]
Azure-winged magpie	741,000,000					[47]
Rock hyrax	756,000,000					[43]
Cat	760,000,000	$\sim 1 \times 10^{13}$				[53]
Black-rumped agouti	857,000,000					[44]

Magpie	897,000,000				[47]
Common hill myna	906,000,000				[47]
Northern greater galago	936,000,000				[50]
Western jackdaw	968,000,000				[47]
Long-eared owl	991,310,000				[34]
Mute swan	1.001×10^9				[34]
Common buzzard	1.001×10^9				[34]
Black vulture	1.009×10^9				[34]
Greater rhea	1.03×10^9				[34]
Eurasian jay	1.085×10^9				[47]
Alexandrine parakeet	1.096×10^9				[47]
Raccoon dog	1.16×10^9				[54]
Tanimbar corella	1.161×10^9				[47]
Saker falcon	1.204×10^9				[34]

Emu	1.335×10^9				[47]
Three-striped night monkey	1.468×10^9				[50]
Rook	1.509×10^9				[47]
Grey parrot	1.566×10^9				[47]
Tawny owl	1.58×10^9				[34]
Capybara	1.6×10^9				[44]
Common ostrich	1.62×10^9				[34]
White-tailed eagle	1.65×10^9				[34]
Jackal	1.73×10^9				[54]
Snowy owl	1.807×10^9				[34]
Eurasian eagle-owl	1.897×10^9				[34]
Fox	2.11×10^9				[54]
Sulphur-crested cockatoo	2.122×10^9				[47]

Raccoon	2.148×10^9				[51]
Kea	2.149×10^9				[47]
Raven	2.171×10^9		Brain only		[47]
Domestic pig	2.22×10^9				[55]
Dog	2.253×10^9				[51]
Chihuahua (dog)	2.51×10^9				[54]
Dog (Chow Chow)	2.61×10^9				[54]
Dog (Yorkshire Terrier)	2.64×10^9				[54]
Springbok	2.72×10^9				[55]
Dog (West Highland White Terrier)	2.83×10^9				[54]
Blesbok	3.06×10^9				[55]
Blue-and-yellow macaw	3.136×10^9		Brain only		[47]
Common squirrel monkey	3.246×10^9				[50]
Crab-eating macaque	3.44×10^9				[49]

Dog (German Shepherd)	3.53×10^{9}				[54]
Tufted capuchin	3.691×10^{9}				[50]
Bonnet macaque	3.78×10^{9}				[49]
Striped hyena	3.885×10^{9}				[51]
Dog (Komondor)	3.99×10^{9}				[54]
Dog (Transylvanian Hound)	4.39×10^{9}				[54]
Lion	4.667×10^{9}				[51]
Greater kudu	4.91×10^{9}				[55]
Rhesus macaque	6.376×10^{9}				[50]
Brown bear	9.586×10^{9}				[51]
Giraffe	1.075×10^{10}				[55]
Yellow baboon	1.095×10^{10}				[49]
Chimpanzee	2.8×10^{10}				[56]
Orangutan	3.26×10^{10}				[57]

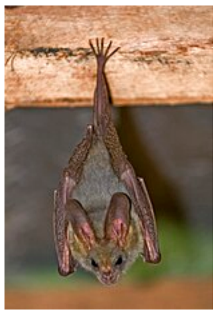
Gorilla	3.34×10^{10}				[57]
Common minke whale	5.7×10^{10}				[58]
Human	8.6×10^{10}	$\sim 1.5 \times 10^{14}$	Neurons for average adult		[59][60][61]
Short-finned pilot whale	1.28×10^{11}				[58]
African elephant	2.57×10^{11}				[62][63]

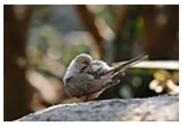
Forebrain (cerebrum or pallium) only

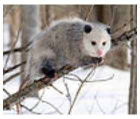
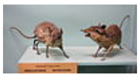
Proxies for animal intelligence have varied over the centuries. One early suggestion was brain size (or weight, which provides the same ordering.) A second proposal was brain-to-body-mass ratio, and a third was encephalization quotient, sometimes referred to as EQ. The current best predictor is number of neurons in the forebrain, based on Herculano-Houzel's improved neuron counts.[1] This accounts for variation in the number of neurons in the rest of the brain, for which no link to intelligence has been established. Elephants, for example, have an exceptionally large cerebellum, while birds make do with a much smaller one.

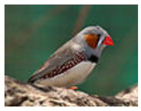
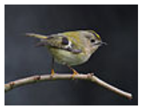
Differing methods have been used to count neurons, and these may differ in degree of reliability. The primary methods are the optical fractionator, an application of stereology and the isotropic fractionator, a recent methodological innovation. Most numbers in the list are the result of studies using the newer isotropic fractionator.[1][40][29][44][45][47][48][49][50][55][56][57][59][60][62][64] A variation of the optical fractionator was responsible for the previous total human brain neuron count of 100,000,000,000 neurons, which has been revised down to 86,000,000,000 by the use of the isotropic fractionator. This is in part why it may be considered to be less reliable. Finally, some numbers are the result of estimations based on correlations observed between number of cortical neurons and brain mass within closely related taxa.

The following table gives information on the number of neurons estimated to be in the sensory-associative structure: the cerebral cortex (aka pallium) for mammals, the dorsal ventricular ridge ("DVR" or "hypopallium") of the pallium for birds, and the corpora pedunculata ("mushroom bodies") for insects.

Common name	Average number of sensory-associative structure neurons[a]	Intraspecific variation[b]	Method[c]	Sensory-associative structure	Binomial nomenclature	Image	S
Common fruit fly	2,500*		Optical fractionator	Corpora pedunculata	*Drosophila melanogaster*		
House cricket	50,000*		Optical fractionator	Corpora pedunculata	*Acheta domesticus*		
Honey bee	170,000*		Optical fractionator	Corpora pedunculata	Genus: *Apis*		
Common cockroach	200,000*		Optical fractionator	Corpora pedunculata	Genus: *Periplaneta*		
African sheath-tailed bat	5,000,000		Isotropic fractionator	Pallium (cortex)	*Coleura afra*		
Rufous trident bat	6,000,000		Isotropic fractionator	Pallium (cortex)	*Triaenops persicus*		
Naked mole-rat	6,000,000	± 1,065,587[43]	Isotropic fractionator	Pallium (cortex)	*Heterocephalus glaber*		
Little free-tailed bat	6,000,000		Isotropic fractionator	Pallium (cortex)	*Chaerephon pumilus*		
Common bent-wing bat	6,000,000		Isotropic fractionator	Pallium (cortex)	*Miniopterus schreibersii*		
Commerson's roundleaf bat	8,000,000		Isotropic fractionator	Pallium (cortex)	*Hipposideros commersoni*		
Heart-nosed bat	10,000,000		Isotropic fractionator	Pallium (cortex)	*Cardioderma cor*		
Ansell's mole-rat	10,000,000		Isotropic fractionator	Pallium (cortex)	*Fukomys anselli*		
Smoky shrew	10,000,000	± 352,000[43]	Isotropic fractionator	Pallium (cortex)	*Sorex fumeus*		
Short-palated fruit bat	10,000,000		Isotropic fractionator	Pallium (cortex)	*Casinycteris argynnis*		
Mashona mole-rat	12,000,000		Isotropic fractionator	Pallium (cortex)	*Fukomys darlingi*		

Woermann's bat	12,000,000		Isotropic fractionator	Pallium (cortex)	*Megaloglossus woermanni*		
Northern short-tailed shrew	12,000,000	± 1,569,000[43]	Isotropic fractionator	Pallium (cortex)	*Blarina brevicauda*		
Zenker's fruit bat	13,000,000		Isotropic fractionator	Pallium (cortex)	*Scotonycteris zenkeri*		
House mouse	14,000,000	± 2,242,257[43]	Isotropic fractionator	Pallium (cortex)	*Mus musculus*		
Hairy-tailed mole	16,000,000	± 2,611,000[43]	Isotropic fractionator	Pallium (cortex)	*Parascalops breweri*		
Star-nosed mole	17,000,000	± 3,105,000[43]	Isotropic fractionator	Pallium (cortex)	*Condylura cristata*		
Golden hamster	17,000,000	± 3,619,934[43]	Isotropic fractionator	Pallium (cortex)	*Mesocricetus auratus*		
Diamond dove	18,209,000		Isotropic fractionator	Pallium (DVR)	*Geopelia cuneata*		
King quail	20,523,000		Isotropic fractionator	Pallium (DVR)	*Synoicus chinensis*		
Damaraland mole-rat	21,000,000		Isotropic fractionator	Pallium (cortex)	*Fukomys damarensis*		
Hottentot golden mole	22,000,000	± 2,154,000[43]	Isotropic fractionator	Pallium (cortex)	*Amblysomus hottentotus*		
Gray mouse lemur	22,310,000		Isotropic fractionator	Pallium (cortex)	Microcebus murinus		
Common quail	22,568,000		Isotropic fractionator	Pallium (DVR)	*Coturnix coturnix*		
Mechow's mole-rat	23,000,000		Isotropic fractionator	Pallium (cortex)	*Fukomys mechowii*		
Franquet's epauletted fruit bat	23,000,000		Isotropic fractionator	Pallium (cortex)	*Epomops franqueti*		
Hammer-headed bat	24,000,000		Isotropic fractionator	Pallium (cortex)	*Hypsignathus mostrosus*		
Hedgehog	24,000,000^		Estimated	Pallium (cortex)	Subfamily Erinaceinae, various species		
Silvery mole-rat	25,000,000		Isotropic fractionator	Pallium (cortex)	*Heliophobius argenteocinereus*		

Wahlberg's epauletted fruit bat	26,000,000		Isotropic fractionator	Pallium (cortex)	*Epomophorus wahlbergi*		
Cape mole-rat	26,000,000		Isotropic fractionator	Pallium (cortex)	*Georychus capensis*		
Guyenne spiny rat	26,000,000	± 2,155,723[43]	Isotropic fractionator	Pallium (cortex)	*Proechimys cayennensis*		
Eastern rock elephant shrew	26,000,000	± 4,020,000[43]	Isotropic fractionator	Pallium (cortex)	*Elephantulus myurus*		
Eastern mole	27,000,000	± 5,113,000[43]	Isotropic fractionator	Pallium (cortex)	*Scalopus aquaticus*		
Opossum	27,000,000^		Estimated	Pallium (cortex)	*Didelphis virginiana*		
Egyptian fruit bat	29,000,000		Isotropic fractionator	Pallium (cortex)	*Rousettus aegyptiacus*		
Brown Rat	31,000,000	+ 3,034,654[43]	Isotropic fractionator	Pallium (cortex)	*Rattus norvegicus*		
Four-toed elephant shrew	34,000,000	± 5,840,000[43]	Isotropic fractionator	Pallium (cortex)	*Petrodromus tetradactylus*		
Grey partridge	36,882,000		Isotropic fractionator	Pallium (DVR)	*Perdix perdix*		
Ferret	38,950,000		Isotropic fractionator	Pallium (cortex)	*Mustela putorius furo*		
Northern bobwhite	39,112,000		Isotropic fractionator	Pallium (DVR)	*Colinus virginianus*		
African collared dove	39,997,000		Isotropic fractionator	Pallium (DVR)	*Streptopelia roseogrisea*		
Cape dune mole-rat	43,000,000		Isotropic fractionator	Pallium (cortex)	*Bathyergus suillus*		
Guinea pig	43,510,000	± 3,169,924[43]	Isotropic fractionator	Pallium (cortex)	*Cavia porcellus*		

Quebracho crested tinamou	48,292,000		Isotropic fractionator	Pallium (DVR)	*Eudromia formosa*		
Common wood pigeon	51,325,000		Isotropic fractionator	Pallium (DVR)	*Columba palumbus*		
Elegant crested tinamou	51,384,000		Isotropic fractionator	Pallium (DVR)	*Eudromia elegans*		
Eurasian blackcap	52,000,000		Isotropic fractionator	Pallium (DVR)	*Sylvia atricapilla*		
Prairie dog	53,770,000	± 6,044,322[43]	Isotropic fractionator	Pallium (cortex)	Genus:*Cynomys*		
Zebra finch	55,000,000		Isotropic fractionator	Pallium (DVR)	*Taeniopygia guttata*		
Chilean tinamou	59,130,000		Isotropic fractionator	Pallium (DVR)	*Nothoprocta perdicaria*		
Common treeshrew	60,000,000	± 26,510,000[43]	Isotropic fractionator	Pallium (cortex)	*Tupaia glis*		
Red junglefowl	61,000,000		Isotropic fractionator	Pallium (DVR)	*Gallus gallus*		
Goldcrest	64,000,000		Isotropic fractionator	Pallium (DVR)	*Regulus regulus*		
European rabbit	71,450,000		Isotropic fractionator	Pallium (cortex)	*Oryctolagus cuniculus*		
Rock dove	72,000,000		Isotropic fractionator	Pallium (DVR)	*Columba livia*		
Eastern gray squirrel	77,330,000	± 2,634,444[43]	Isotropic fractionator	Pallium (cortex)	*Sciurius carolinensis*		
Reeves's pheasant	80,688,000		Isotropic fractionator	Pallium (DVR)	*Syrmaticus reevesii*		
Great tit	83,000,000		Isotropic fractionator	Pallium (DVR)	*Parus major*		

Eurasian sparrowhawk	87,832,000		Isotropic fractionator	Pallium (DVR)	*Accipiter nisus*		
Western tree hyrax	99,000,000		Isotropic fractionator	Pallium (cortex)	*Dendrohyrax dorsalis*		
Green-rumped parrotlet	103,000,000		Isotropic fractionator	Pallium (DVR)	*Forpus passerinus*		
Wild turkey	105,654,000		Isotropic fractionator	Pallium (DVR)	*Meleagris gallopavo*		
Mallard	112,255,000		Isotropic fractionator	Pallium (DVR)	*Anas platyrhynchos*		
Black-rumped agouti	113,000,000	± 2,576,768[43]	Isotropic fractionator	Pallium (cortex)	*Dasyprocta prymnolopha*		
Banded mongoose	115,770,000		Isotropic fractionator	Pallium (cortex)	*Mungos mungo*		
Victoria crowned pigeon	118,445,000		Isotropic fractionator	Pallium (DVR)	*Goura victoria*		
Yellow-knobbed curassow	124,624,000		Isotropic fractionator	Pallium (DVR)	*Crax daubentoni*		
Indian peafowl	129,621,000		Isotropic fractionator	Pallium (DVR)	*Pavo cristatus*		
Marbled duck	130,142,000		Isotropic fractionator	Pallium (DVR)	*Marmaronetta angustirostris*		
Pygmy falcon	131,898,000		Isotropic fractionator	Pallium (DVR)	*Polihierax semitorquatus*		
Common blackbird	136,000,000		Isotropic fractionator	Pallium (DVR)	*Turdus merula*		
Wood duck	138,206,000		Isotropic fractionator	Pallium (DVR)	*Aix sponsa*		

Red-breasted goose	148,617,000		Isotropic fractionator	Pallium (DVR)	*Branta ruficollis*		
Budgerigar	149,000,000		Isotropic fractionator	Pallium (DVR)	*Melopsittacus undulatus*		
Eurasian teal	167,287,000		Isotropic fractionator	Pallium (DVR)	*Anas crecca*		
Rock hyrax	198,000,000	± 29,082,000[43]	Isotropic fractionator	Pallium (cortex)	*Procavia capensis*		
Northern greater galago	226,000,000	± 87,570,000[43]	Isotropic fractionator	Pallium (cortex)	*Otolemur garnettii*		
Common starling	226,000,000		Isotropic fractionator	Pallium (DVR)	*Sturnus vulgaris*		
Common kestrel	237,903,000		Isotropic fractionator	Pallium (DVR)	*Falco tinnunculus*		
Raccoon dog	240,180,000		Isotropic fractionator	Pallium (cortex)	*Nyctereutes procyonoides*		
Common marmoset	245,000,000	± 81,180,000[43]	Isotropic fractionator	Pallium (cortex)	*Callithrix jacchus*		
House cat	249,830,000		Isotropic fractionator	Pallium (cortex)	*Felis catus*		
Brown bear	250,970,000		Isotropic fractionator	Pallium (cortex)	*Ursus arctos*		
Cockatiel	258,000,000		Isotropic fractionator	Pallium (DVR)	*Nymphicus hollandicus*		
Greylag goose	258,650,000		Isotropic fractionator	Pallium (DVR)	*Anser anser*		
Capybara	306,500,000	± 62,726,120[43]	Isotropic fractionator	Pallium (cortex)	*Hydrochoerus hydrochaeris*		

Tarsius	310,000,000		Estimated	Pallium (cortex)	Genus: *Tarsius*, unknown species		
Mute swan	323,661,000		Isotropic fractionator	Pallium (DVR)	*Cygnus olor*		
Greater rhea	330,342,000		Isotropic fractionator	Pallium (DVR)	*Rhea americana*		
Eastern rosella	333,000,000		Isotropic fractionator	Pallium (DVR)	*Platycercus eximius*		
Common buzzard	351,700,000		Isotropic fractionator	Pallium (DVR)	*Buteo buteo*		
Red fox	355,010,000		Isotropic fractionator	Pallium (cortex)	*Vulpes vulpes*		
Goeldi's marmoset	357,130,000		Isotropic fractionator	Pallium (cortex)	*Callimico goeldii*		
Eurasian pygmy owl	364,000,000		Isotropic fractionator	Pallium (DVR)	*Glaucidium passerinum*		
Western grey kangaroo	370,170,000		Isotropic fractionator	Pallium (cortex)	*Macropus fuliginosus*		
Golden jackal	393,620,000		Isotropic fractionator	Pallium (cortex)	*Canis aureus*		
Monk parakeet	396,000,000		Isotropic fractionator	Pallium (DVR)	*Myiopsitta monachus*		
Springbok	396,900,000		Isotropic fractionator	Pallium (cortex)	*Antidorcas marsupialis*		
Black vulture	398,899,000		Isotropic fractionator	Pallium (DVR)	*Coragyps atratus*		
Azure-winged magpie	400,000,000		Isotropic fractionator	Pallium (DVR)	*Cyanopica cyanus*		

Little owl	400,822,000		Isotropic fractionator	Pallium (DVR)	*Athene noctua*		
Common hill myna	410,000,000		Isotropic fractionator	Pallium (DVR)	*Gracula religiosa*		
Domesticated pig	425,000,000*		Optical fractionator	Pallium (cortex)	*Sus scrofa domesticus*		
Barn owl	437,000,000		Isotropic fractionator	Pallium (DVR)	*Tyto alba*		
Emu	439,000,000		Isotropic fractionator	Pallium (DVR)	*Dromaius novaehollandiae*		
West Highland White Terrier	440,160,000		Isotropic fractionator	Pallium (cortex)	*Canis lupus familiaris*		
Three-striped night monkey	442,000,000	± 111,310,000[43]	Isotropic fractionator	Pallium (cortex)	*Aotus trivirgatus*		
Saker falcon	442,946,000		Isotropic fractionator	Pallium (DVR)	*Falco cherrug*		
Eurasian magpie	443,000,000		Isotropic fractionator	Pallium (DVR)	*Pica pica*		
Raccoon	453,000,000		Isotropic fractionator	Pallium (cortex)	*Procyon lotor*		
Chow Chow	471,500,000		Isotropic fractionator	Pallium (cortex)	*Canis lupus familiaris*		
Common ostrich	479,410,000		Isotropic fractionator	Pallium (DVR)	*Struthio camelus*		
Western jackdaw	492,000,000		Isotropic fractionator	Pallium (DVR)	*Coloeus monedula*		
Striped hyena	495,280,000		Isotropic fractionator	Pallium (cortex)	*Hyaena hyaena*		

Chihuahua	513,330,000		Isotropic fractionator	Pallium (cortex)	*Canis lupus familiaris*		
Eurasian jay	529,000,000		Isotropic fractionator	Pallium (DVR)	*Garrulus glandarius*		
White-tailed eagle	542,926,000		Isotropic fractionator	Pallium (DVR)	*Haliaeetus albicilla*		
Lion	545,240,000		Isotropic fractionator	Pallium (cortex)	*Panthera leo*		
Blesbok	570,670,000		Isotropic fractionator	Pallium (cortex)	*Damaliscus pygargus phillipsi*		
Yorkshire Terrier	572,140,000		Isotropic fractionator	Pallium (cortex)	*Canis lupus familiaris*		
Alexandrine parakeet	575,000,000		Isotropic fractionator	Pallium (DVR)	*Psittacula eupatria*		
Tanimbar corella	599,000,000		Isotropic fractionator	Pallium (DVR)	*Cacatua goffiniana*		
Golden retriever	627,000,000		Isotropic fractionator	Pallium (cortex)	*Canis lupus familiaris*		
Long-eared owl	673,000,000		Isotropic fractionator	Pallium (DVR)	*Asio otus*		
Transylvanian Hound	725,760,000		Isotropic fractionator	Pallium (cortex)	*Canis lupus familiaris*		
Greater kudu	762,570,000		Isotropic fractionator	Pallium (cortex)	*Tragelaphus strepsiceros*		
Crab-eating macaque	800,960,000		Isotropic fractionator	Pallium (cortex)	*Macaca fascicularis*		

Rook	820,000,000		Isotropic fractionator	Pallium (DVR)	*Corvus frugilegus*		
Beagle	844,410,000		Isotropic fractionator	Pallium (cortex)	*Canis lupus familiaris*		
Grey parrot	850,000,000		Isotropic fractionator	Pallium (DVR)	*Psittacus erithacus*		
Komondor	883,380,000		Isotropic fractionator	Pallium (cortex)	*Canis lupus familiaris*		
German Shepherd	885,460,000		Isotropic fractionator	Pallium (cortex)	*Canis lupus familiaris*		
Sulphur-crested cockatoo	1,135,000,000		Isotropic fractionator	Pallium (DVR)	*Cacatua galerita*		
Tufted capuchin	1,140,000,000		Isotropic fractionator	Pallium (cortex)	*Sapajus apella*		
Tawny owl	1,153,000,000		Isotropic fractionator	Pallium (DVR)	*Strix aluco*		
Harp seal	1,168,000,000^ 6,100,000,000*		Estimated Optical fractionator	Pallium (cortex)	*Pagophilus groenlandicus*		
Horse	1,200,000,000^		Estimated	Pallium (cortex)	*Equus ferus caballus*		
Raven	1,204,000,000		Isotropic fractionator	Pallium (DVR)	*Corvus corax*		
Snowy owl	1,270,000,000		Isotropic fractionator	Pallium (DVR)	*Bubo scandiacus*		
Kea	1,281,000,000		Isotropic fractionator	Pallium (DVR)	*Nestor notabilis*		

Eurasian eagle-owl	1,328,000,000		Isotropic fractionator	Pallium (DVR)	*Bubo bubo*		
Common squirrel monkey	1,340,000,000	± 20,000,000[43]	Isotropic fractionator	Pallium (cortex)	*Saimiri sciureus*		
Bonnet macaque	1,660,000,000		Isotropic fractionator	Pallium (cortex)	*Macaca radiata*		
Rhesus macaque	1,710,000,000		Isotropic fractionator	Pallium (cortex)	*Macaca mulatta*		
Giraffe	1,731,000,000		Isotropic fractionator	Pallium (cortex)	*Giraffa camelopardalis*		
Blue and yellow macaw	1,900,000,000		Isotropic fractionator	Pallium (DVR)	*Ara ararauna*		
Pygmy sperm whale	2,020,000,000*		Optical fractionator	Pallium (cortex)	*Kogia breviceps*		
Leopard seal	2,386,000,000^		Estimated	Pallium (cortex)	*Hydrurga leptonyx*		
Guenon	2,500,000,000^		Estimated	Pallium (cortex)	Genus: *Cercopithecus*, unknown species		
Pigtail Macaque	2,531,000,000^		Estimated	Pallium (cortex)	*Macaca nemestrina*		
Gelada baboon	2,568,000,000^		Estimated	Pallium (cortex)	*Theropithecus gelada*		
Red-and-green macaw	2,646,000,000^		Estimated	Pallium (DVR)	*Ara chloropterus*		
Harbor porpoise	2,750,000,000*		Optical fractionator	Pallium (cortex)	*Phocoena phocoena*		

Yellow baboon	2,880,000,000		Isotropic fractionator	Pallium (cortex)	*Papio cynocephalus*		
Hyacinth macaw	2,944,000,000^		Estimated	Pallium (DVR)	*Anodorhynchus hyacinthinus*		
Hamadryas baboon	2,990,000,000^		Estimated	Pallium (cortex)	*Papio hamadryas*		
Mandrill	3,102,000,000^		Estimated	Pallium (cortex)	*Mandrillus sphinx*		
Common minke whale	3,134,000,000 12,800,000,000*		Isotropic fractionator Optical fractionator	Pallium (cortex)	*Balaenoptera acutorostrata*		
Walrus	3,929,000,000^		Estimated	Pallium (cortex)	*Odobenus rosmarus*		
Southern elephant seal	3,994,000,000^		Estimated	Pallium (cortex)	*Mirounga leonina*		
Fin whale	5,000,000,000^ 15,000,000,000^		Estimated	Pallium (cortex)	*Balaenoptera physalus*		
Blue whale	5,000,000,000^		Estimated	Pallium (cortex)	*Balaenoptera musculus*		
African elephant	5,600,000,000		Isotropic fractionator	Pallium (cortex)	*Loxodonta africana*		
Pygmy chimpanzee or bonobo	6,250,000,000^		Estimated	Pallium (cortex)	*Pan paniscus*		
Short-beaked common dolphin	6,700,000,000* 4,800,000,000^		Optical fractionator Estimated	Pallium (cortex)	*Delphinus delphis*		

Asian elephant	6,775,000,000^		Estimated	Pallium (cortex)	*Elephas maximus*		
Chimpanzee	7,400,000,000*		Optical fractionator	Pallium (cortex)	*Pan troglodytes*		
Orangutan	7,704,000,000^ - 8,900,000,000^		Estimated	Pallium (cortex)	Genus: *Pongo*		
Western gorilla	9,100,000,000^		Estimated	Pallium (cortex)	*Gorilla gorilla*		
Cuvier's beaked whale	9,100,000,000*		Optical fractionator	Pallium (cortex)	*Ziphius cavirostris*		
Beluga whale	10,000,000,000^		Estimated	Pallium (cortex)	*Delphinapterus leucas*		
Risso's dolphin	10,000,000,000^		Estimated	Pallium (cortex)	*Grampus griseus*		
Short-finned pilot whale	11,850,000,000		Isotropic fractionator	Pallium (cortex)	*Globicephala macrorhynchus*		
Bottlenose dolphin	12,700,000,000* 8,700,000,000^		Optical fractionator Estimated	Pallium (cortex)	*Tursiops truncatus*		
Long-finned pilot whale	13,966,000,000^ 37,200,000,000*		Estimated Optical fractionator	Pallium (cortex)	*Globicephala melas*		
Human	16,340,000,000 21,000,000,000*	± 2,170,000,000[43]	Isotropic fractionator Optical fractionator	Pallium (cortex)	*Homo sapiens*		[43][5

Orca	43,100,000,000* 21,000,000,000^		Optical fractionator Estimated	Pallium (cortex)	*Orcinus orca*		

See also

- Lists of animals
- Theory of mind in animals
- Brain size
- Brain–body mass ratio
- Encephalization quotient
- Connectome
- Connectomics
- Cranial capacity
- fr:Noogenèse
- Neuroscience and intelligence

Notes

a. ^ = Estimated
 * = Optical fractionator

b. ± standard deviation

c. For the estimated values, the numbers of cortical neurons estimated from brain mass for different mammalian and bird orders are based on correlation observed between number of cortical neuron and brain mass per order[43]

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