

Primate species in Darwin's major books on evolution

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In the post-publication controversy that erupted following the release of his influential book *On the Origin of Species*, Charles Darwin came to be identified with monkeys in the popular press of the day. Caricatures of Darwin's head in a monkey body appeared in periodical cartoons. The objective of our study was to identify the primate species that appear in Darwin's three major books by current zoological names. Darwin had annotated nearly 50 primate species by zoological names and a few additional primates by common names in his four major books on evolution namely, *The Voyage of the Beagle* (1839), *The Origin of Species* (1859), *The Descent of Man* (1871), and *The Expression of the Emotion in Man and Animals* (1872). The results are provided in three tables.

Charles Darwin's (1809–1882) status as a pioneer in evolutionary research is well recognized due to the remarkable impact on evolution of his four major books namely, *The Voyage of the Beagle* (1839), *On the Origin of Species* (1859), *The Descent of Man* (1871), and *Expression of Emotion in Man and Animals* (1872) had on the development of biological sciences^{1–5}. Correspondingly, Darwin's stature as one of the synthesizer's of 19th century primatology is also notable⁶, though his field observations on primates were rather limited.

In the post-publication controversy that erupted following the release of his influential book *On the Origin of Species*, Darwin came to be identified with monkeys in the popular press of the day^{7–9}. Caricatures of Darwin's head in a monkey body appeared in periodical cartoons (Figure 1). A few of Darwin's adversaries such as Adam Sedgwick, a professor in geology at the Cambridge University, taunted him with words such as 'a son of a monkey and an old friend of yours'¹⁰. As such, to felicitate the sesquicentenary of the publication of Darwin's first book on evolution, *On the Origin of Species*^{11–13}, we focused on the objective of identifying the nonhuman primate species that appear in Darwin's three major books on evolution by current zoological names.

Methods

We scanned the four books authored by Darwin, viz. *The Voyage of the Beagle*, *On the Origin of Species*, *The Descent of Man*, and *Expression of Emotion in Man and Animals*, with a specific purpose of identifying the primate species annotated by common names and zoological names, as prevalent during Darwin's period.

Though primate taxonomy has been constantly evolving and alignments of some species are still in dispute, in this report the current zoological designations follow the descriptions of Rowe¹⁴ and Groves¹⁵.

Results

In Darwin's first book, *The Voyage of the Beagle*, annotations to primates in his diary entries were scanty. Only in three



Figure 1. Charles Darwin as viewed by his contemporary cartoonists and caricaturists. **a**, Andre Gill in the French magazine *La Petite Lune* (c. 1870); **b**, An 'incorrigible artist' in the *Hornet* magazine (22 March 1871); **c**, Gordon Thompson in the *Fun* magazine (c. 1872); **d**, Linley Sambourne in the *Punch's Almanack for 1882*.

HISTORICAL NOTES

Table 1. New World Primates mentioned in Darwin's major books on evolution

Primate species* receiving specific mention in Darwin's books on evolution	Evolution books	Current zoological designation with the common name
<i>Ateles beelzebuth</i>	DM	<i>Ateles belzebuth</i> (white-bellied spider monkey)
<i>Ateles marginatus</i>	DM	<i>Ateles marginatus</i> (white-whiskered spider monkey)
<i>Cebus apella</i>	DM	<i>Cebus apella apella</i> (brown capuchin)
<i>Cebus azarae</i>	DM, EEMA	<i>Cebus apella nigritus</i> (black tufted capuchin)
<i>Cebus capucinus</i>	DM	<i>Cebus capucinus</i> (white-throated capuchin)
<i>Cebus hypoleucus</i>	EEMA	<i>Cebus capucinus</i> (white-throated capuchin)
<i>Cebus vellerosus</i>	DM	<i>Cebus apella vellerosus</i> (brown capuchin)
<i>Mycetes caraya</i>	DM	<i>Alouatta caraya</i> (black and gold howler monkey)
<i>Mycetes seniculus</i>	DM	<i>Alouatta seniculus</i> (red howler monkey)
<i>Pithecia leucocephala</i>	DM	<i>Pithecia pithecia</i> (white-faced saki)
<i>Pithecia satanas</i>	DM	<i>Chiropotes satanas</i> (bearded saki)

*Listed in alphabetical order according to the genus. Names provided by Darwin have been retained.

DM, *The Descent of Man*; EEMA, *Expression of Emotions in Man and Animals*.

Table 2. Old World Primates mentioned in Darwin's major books on evolution

Primate species* receiving specific mention in Darwin's books on evolution	Evolution books	Current zoological designation with the common name
<i>Cercocebus aethiops</i>	DM	<i>Cercocebus torquatus</i> (white-collared mangabey)
<i>Cercopithecus</i> (sp. unidentified)	OS	
<i>Cercopithecus cephus</i>	DM	<i>Cercopithecus cephus</i> (mustached guenon)
<i>Cercopithecus cynosurus</i>	DM	<i>Cercopithecus aethiops cynosurus</i> (Malbrouck monkey)
<i>Cercopithecus diana</i>	DM	<i>Cercopithecus diana</i> (Diana monkey)
<i>Cercopithecus griseo-viridis</i>	DM	<i>Chlorocebus aethiops</i> (vervet, grivet or green monkey)
<i>Cercopithecus nictitans</i>	EEMA	<i>Cercopithecus nictitans</i> (putty-nosed guenon)
<i>Cercopithecus petaurista</i>	DM	<i>Cercopithecus petaurista</i> (Lesser spot-nosed guenon)
<i>Cercopithecus ruber</i>	EEMA	<i>Erythrocebus patas</i> (Patas monkey)
<i>Cynocephalus anubis</i>	EEMA	<i>Papio hamadryas anubis</i> (olive baboon)
<i>Cynocephalus babouin</i>	DM	<i>Papio hamadryas cynocephalus</i> (yellow baboon)
<i>Cynocephalus chacma</i>	DM	<i>Papio hamadryas ursinus</i> (chacma baboon)
<i>Cynocephalus gelada</i>	DM	<i>Theropithecus gelada</i> (gelada baboon)
<i>Cynocephalus hamadryas</i>	DM	<i>Papio hamadryas hamadryas</i> (hamadryas baboon)
<i>Cynocephalus leucophus</i>	DM	<i>Mandrillus leucophaeus</i> (drill)
<i>Cynocephalus mormon</i>	DM	<i>Mandrillus sphinx</i> (mandrill)
<i>Cynocephalus porcarius</i>	DM	<i>Papio hamadryas ursinus</i> (chacma baboon)
<i>Cynocephalus sphinx</i>	DM	<i>Mandrillus sphinx</i> (mandrill)
<i>Cynopithecus niger</i>	DM, EEMA	<i>Macaca nigra</i> (Crested black macaque)
<i>Hylobates agilis</i>	DM	<i>Hylobates agilis</i> (agile gibbon)
<i>Hylobates lar</i>	DM	<i>Hylobates lar</i> (white-handed gibbon)
<i>Hylobates leuciscus</i>	DM	<i>Hylobates moloch</i> (Silvery Javan gibbon)
<i>Hylobates syndactylus</i>	DM, EEMA	<i>Hylobates syndactylus</i> (siamang)
<i>Inuus ecaudatus</i>	EEMA	<i>Macaca sylvanus</i> (barbary macaque)
<i>Lemur macaco</i>	DM	<i>Eulemur macaco</i> (black lemur)
<i>Macacus brunneus</i>	DM	<i>Macaca arctoides</i> (stump-tailed macaque)
<i>Macacus cynomolgus</i>	DM	<i>Macaca fascicularis</i> (long-tailed macaque)
<i>Macacus ecaudatus</i>	DM	<i>Macaca sylvanus</i> (barbary macaque)
<i>Macacus lasiotus</i>	DM	<i>Macaca mulatta lasiota</i> (rhesus macaque)
<i>Macacus maurus</i> or <i>Macaus inornatus</i>	EEMA	<i>Macaca maura</i> (Moor macaque)
<i>Macacus nemestrinus</i>	DM	<i>Macaca nemestrina</i> (pig-tailed macaque)
<i>Macacus radiatus</i>	DM	<i>Macaca radiata</i> (bonnet macaque)
<i>Macacus rhesus</i>	DM, EEMA	<i>Macaca mulatta</i> (rhesus macaque)
<i>Semnopithecus chrysomelas</i>	DM	<i>Presbytis melalophos</i> (mottled leaf monkey)
<i>Semnopithecus comatus</i>	DM	<i>Presbytis comata</i> (grizzled leaf monkey)
<i>Semnopithecus frontatus</i>	DM	<i>Presbytis frontata</i> (white-fronted leaf monkey)
<i>Semnopithecus nasica</i>	DM	<i>Nasalis larvatus</i> (proboscis monkey)
<i>Semnopithecus nemeus</i>	DM	<i>Pygathrix nemeus</i> (red shanked douc langur)
<i>Semnopithecus rubicundus</i>	DM	<i>Presbytis rubicunda</i> (red leaf monkey)
<i>Tarsius</i> (sp. unidentified)	DM	

*Listed in alphabetical order according to the genus. Names provided by Darwin have been retained. In addition, orangutan, gorilla and chimpanzee have received mention in the book *The Descent of Man* by common name only.

DM, *The Descent of Man*; EEMA, *Expression of Emotions in Man and Animals*; OS, *On The Origin of Species*.

Table 3. Figures depicting primates in Darwin's major books on evolution

Figure captions depicting primates*	Evolution book	Figure no. quoted in the book
Foetus of orangutan	DM	3
<i>Pithecia satanas</i> , male	DM	68
Head of male Mandrill	DM	69
Head of <i>Semnopithecus rubicundus</i>	DM	72
Head of <i>Semnopithecus comatus</i>	DM	73
Head of <i>Cebus capucinus</i>	DM	74
Head of <i>Ateles marginatus</i>	DM	75
Head of <i>Cebus vellerosus</i>	DM	76
<i>Cercopithecus petaurista</i>	DM	77
<i>Cercopithecus diana</i>	DM	78
<i>Cynopithecus niger</i> in a placid condition	EEMA	16
<i>Cynopithecus niger</i> , when caressed	EEMA	17
Chimpanzee, disappointed and sulky	EEMA	18

*Listed in the sequential order arranged in the book. Primate names provided by Darwin have been retained. DM, *The Descent of Man*; EEMA, *Expression of Emotions in Man and Animals*.

instances, were primates even mentioned, but not identified by species. The longest annotation among the three appears on 19 April 1832, while he was at Rio de Janeiro, Brazil. The relevant quote is as follows:

'My companion, the day before, had shot two large bearded monkeys. These animals have prehensile tails, the extremity of which, even after death, can support the whole weight of the body. One of them thus remained fast to a branch, and it was necessary to cut down a large tree to procure it. This was soon effected, and down came tree and monkey with an awful crash³.' In all probability, we infer that this reference to 'bearded monkeys' by Darwin relates to brown howler monkey (*Alouatta fusca*) whose habitat is restricted to the Atlantic Coast of Brazil.

Similarly, reference to primates was meagre in Darwin's *On the Origin of Species*. Only two references can be provided as examples. Referring to the prehensile tail, Darwin had observed the following: 'The extremity of the tail in some American monkeys has been converted into a wonderfully perfect prehensile organ, and serves as a fifth hand. Brehm saw the young of an African monkey (*Cercopithecus*) clinging to the under surface of their mother by their hands, and at the same time they hooked their little tails round that of their mother. Why *Cercopithecus*, considering its habits whilst young, has not become thus provided, it would be difficult to say. It is, however, possible that the long tail of this monkey may be of more service to it as a balancing organ in making its prodigious leaps, than as a prehensile organ^{1,2}.' Subsequently, Darwin countered Cuvier's thoughts on the availabil-

ity of archeological monkey remains as, 'Cuvier used to urge that no monkey occurred in any tertiary stratum; but now extinct species have been discovered in India, South America and in Europe, as far back as the Miocene stage^{1,2}.'

However, as indicated in Tables 1–3, substantial annotations to primates were included by Darwin in his two books, *The Descent of Man* and *Expression of Emotion in Man and Animals* that followed *On the Origin of Species*. Cumulatively, in his three major books on evolution that appeared between 1859 and 1872, Darwin had annotated nearly 50 primates by their zoological names. A complete checklist of these primates is presented in Tables 1 (New World Primates) and 2 (Old World Primates). A few additional primates such as orangutan, gorilla and chimpanzee have also been mentioned by their common names. With due allowance to the then prevalent information on primate diversity and reports of such diversity in the mid-19th century, the number of primates included by Darwin in his major books on evolution appears impressive. It also confirms Darwin's expertise as a distiller and synthesizer of knowledge on extant primates.

In addition, as indicated in Table 3, hand-drawn figures representing 10 primates appear in *The Descent of Man*⁴ to supplement the text. Three additional figures of primates also appear in the *Expression of the Emotions in Man and Animals*⁵.

Discussion

Among the three influential books on evolution that followed *The Voyage of*

the Beagle, major references by Darwin to primates including humans appeared in *The Descent of Man* and *Expression of Emotion in Man and Animals*¹⁶. However, in his first book, *On the Origin of Species* published in 1859 where Darwin proposed his evolutionary theory of natural selection, references to nonhuman primates were meagre. In *The Descent of Man*, Darwin's focus was to study 'firstly, whether man, like every other species, is descended from some pre-existing form; secondly, the manner of his development, and thirdly, the value of the differences between the so-called races of man⁴'. The objective of authoring the *Expression of Emotion in Man and Animals*, according to Darwin, was to 'ascertain, independently of common opinion, how far particular movements of the features and gestures are really expressive of certain states of mind⁵'.

In summary, previously Loy⁶ had provided a useful guide to Darwin's writings on primatology. However, the absence of zoological names of primates annotated by Darwin was a lapse of that guide. Hopefully, data presented in Tables 1–3 rectify this lapse.

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HISTORICAL NOTES

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MEETINGS/SYMPOSIA/SEMINARS

7th Asia-Pacific Conference on Algal Biotechnology—Algal Biotechnology in the Asia-Pacific Region: New Challenges and Opportunities for the 21st Century

Date: 1–4 December 2009

Place: Delhi

Topics include: Algal Bio fuels – Algal Biodiesel, Bio ethanol, Biological hydrogen production; Algae and global warming – Carbon capture by algae and carbon trading; Algae in bioengineering – Photo bioreactors, Raceway ponds; Algal biomass production, Processing, Technology and marketing; Taxonomy, Ecology and Biodiversity of algae; Physiology, biochemistry, genetics and molecular biology of algae; Algae in bioremediation, Waste water treatment and water recycling; Food, pharmaceuticals and nutraceuticals from algae; Algae, aquaculture and rural development; Future of algal research and utilization.

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National Seminar on Emerging Trends in Environment and Development

Date: 8–9 October 2009

Place: Thiruvananthapuram

Themes include: Physico-chemical environment – air, water and land; Water resources – water quality, remediation, management; Land degradation and waste management; Air pollution and global warming; Climate change impacts on resources; Biological environment – forest resources; Resource depletion and management; Biodiversity challenges; Environmental Engineering – Pollution control technologies – Biotechnological; Economic and Social Environment – environmental sanitation; India's environmental policy and regulations; Sustainable Development – New strategies.

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