[Obituary of Hugh Falconer].

Contributors

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[*From the* Obituary Notices *of the* Proceedings of the Royal Society, vol. xv.]

The science of Palæontology has sustained a great loss in the death of Hugh Falconer, M.D. Born at Forres, in the north of Scotland, on the 29th of February, 1808, he received his early education at the Grammar school of that town, and afterwards studied Arts at the University of King's College, Aberdeen, and Medicine at the University of Edinburgh. From the former University he received the degree of A.M.; and from the latter, in 1829, the degree of M.D.

As a boy, he exhibited a decided taste for the study of natural objects, which he eagerly followed up in Edinburgh under the systematic tuition of Professors Graham and Jameson. On visiting London in 1829, he availed himself of the opportunity to assist the late Dr. Nathaniel Wallich in the distribution of his great Indian herbarium, and to study the collection of Indian fossil mammalia from the banks of the Irrawaddi, formed by Mr. John Crawfurd during his mission to Ava, and presented by him to the Geological Society. Both occupations proved of material service in his subsequent career, and in the latter instance it determined the labours to which he afterwards so zealously devoted himself.

In 1830 Dr. Falconer proceeded to India as an Assistant-Surgeon in the H.E.I.C. Service, and arrived in Calcutta in September of that year. Here he at once undertook an examination of fossil bones from Ava, in the possession of the Asiatic Society of Bengal, and published a description of them, which at once gave him a recognized position in the roll of cultivators of science in India, and led to his being appointed in 1832 to succeed Dr. Royle as Superintendent of the Botanic Gardens of Suharunpoor, in the North-western Provinces.

In the same year (1832) he made an excursion to the Sub-Himalayan range, and from the indication of a specimen in the collection of his friend and colleague, Captain, now Sir Proby T. Cautley, the real nature of

which had been previously overlooked, he was led to discover vertebrate fossil remains *in situ* in the tertiary strata of the Sewalik Hills. The search was speedily followed up with characteristic energy by Captain Cautley in the Kalowala Pass, by means of blasting, and resulted in the discovery of more perfect remains, including miocene mammalian genera. The finding, therefore, of the fossil fauna of the Sewalik Hills was not fortuitous, but a result led up to by researches suggested by previous special study, and followed out with a definite aim. Early in 1834 Dr. Falconer gave a brief account of the Sewalik Hills, describing their physical features and geological structure, and showing their relation to the Himalayahs (Journ. Asiat. Soc. of Bengal, vol. iii. p. 182). The name "Sewalik" had been vaguely applied before then by Rennell and others to the outer ridges of the true Himalayahs, and the lower elevations towards the plains. Dr. Falconer restricted the term definitely to the flanking tertiary range, which is commonly separated from the Himalayahs by valleys or *Doons*. The proposed name was not favourably received at the time by geographical authorities in India; but it is now universally adopted in geography and geology as a convenient and well-founded designation. On his first visit to the Sewalik Hills, Dr. Falconer concluded that they did not belong to the "New Red Sandstone," to which they had been referred by Captain Herbert, but that they were of a tertiary age, and analogous to the *Molasse* of Switzerland. Thirty years of subsequent investigation by other geologists have not altered that determination, although our exact knowledge of the formation has been greatly extended.

The researches thus begun were followed about the end of 1834 by the discovery by Lieutenants Baker and Durand of the great ossiferous deposit of the Sewaliks, near the valley of the Markunda, westward of the Jumna, and below Nahun. Captain Cautley and Dr. Falconer were immediately in the field, and by the joint labours of these four officers a subtropical mammalian fossil fauna was brought to light, unexampled for richness and extent in any other region then known. It included the earliest discovered fossil *Quadrumana**, an extraordinary number of *Proboscidia* belonging to *Mastodon*, *Stegodon*, and *Elephas*; several extinct species of *Rhinoceros*; *Chalicotherium*; two new subgenera of *Hippopotamus*, viz. *Hexaprotodon* and *Merycopotamus*; several species of *Sus* and *Hippohyus*, and of *Equus* and *Hippotherium*; the colossal ruminant *Sivatherium*, together with fossil species of *Camel*, *Giraffe*, *Cervus*, *Antilope*, *Capra*, and new types of *Bovidæ*; *Carnivora* belonging to the new genera *Sivalarctos* and *Enhydriodon*, and also *Machairodus*, *Felis*, *Hyæna*, *Canis*, *Gulo*, *Lutra*, &c.; among the *Aves*, species of *Ostrich*, *Cranes*, &c. Among the *Reptilia*, *Monitors*, and *Crocodiles*, of living and extinct species, the enormous

* Dr. Falconer's first published memoir on the Quadrumana of the Sewalik Hills was dated November 24th, 1836, and it was not until January 16th, 1837, that M. Lartet's memoir on the discovery of the jaw of an Ape in the tertiary freshwater formation of Simorre was presented to the French Academy of Sciences.

tortoise, *Colossochelys Atlas*, with numerous species of *Emys* and *Trionyx*; and among fossil Fish, *Cyprinidæ* and *Siluridæ*. The general facies of the extinct fauna exhibited a congregation of forms participating in European, African, and Asiatic types. Thrown suddenly upon such rich materials, the ordinary means resorted to by men of science for determining them by comparison were wanting. Of palæontological works or osteological collections in that remote quarter of India there were none. But Falconer was not the man to be baffled by such discouragements. He appealed to the living forms abounding in the surrounding forests, rivers, and swamps to supply the want. Skeletons of all kinds were prepared; the extinct forms were compared, with their nearest living analogues, and a series of memoirs by Dr. Falconer and Captain Cautley, descriptive of the most remarkable of the newly discovered forms, appeared in the 'Asiatic Researches,' the 'Journal of the Asiatic Society of Bengal,' and in the 'Geological Transactions.' The Sewalik explorations soon attracted notice in Europe, and in 1837 the Wollaston Medal, in duplicate, was awarded for their discoveries to Dr. Falconer and Capt. Cautley by the Geological Society.

In 1834 a Commission was appointed by the Bengal Government to inquire into and report on the fitness of India for the growth of the tea-plant of China. Acting on the information and advice supplied by Dr. Falconer (Journ. Asiat. Soc. of Bengal, 1834, iii. p. 182), the Commission recommended a trial. The Government adopted the recommendation; the plants were imported from China, and the experimental researches were placed under Falconer's superintendence in sites selected by him. Tea culture has since then greatly extended in India, and the tea of Bengal bids fair to become one of the most important commercial exports from India, as Falconer long ago predicted.

In 1837 Dr. Falconer was ordered to accompany Burnes's second mission to Caubul, which preceded the Affghan war. Proceeding first westward to Kohat and the lower part of the valley of Bunguish, he examined the Trans-Indus portion of the Salt-range, and then made for Cashmeer, where he passed the winter and spring in examining the natural history of the valley, and in making extensive botanical collections. The following summer (1838) he crossed the mountains to Iskardo, in Bulkistan, and traced the Shiggar branch of the Indus to its source in the glacier, on the southern flank of the Mooztagh range. Having examined the great glaciers of Arindoh and of the Brahldoh valley, he then returned to India *viâ* Cashmeer and the Punjab, towards the close of 1838, to resume charge of his duties at Suharunpoor. His report of this expedition was at the time one of great interest and importance.

In this, as in many other scientific expeditions, Falconer's health suffered greatly from the results of incessant exposure; and in 1842 he was compelled to return to Europe on sick leave, bringing with him the natural history collections amassed by him during ten years of exploration of the

Himalayahs, of the plains of India, and of the valley of Cashmeer. They amounted to eighty cases of dried plants, and about fifty large cases of fossil bones, together with geological specimens, illustrative of the Himalayan formations from the Indus to the Gogra, and from the plains of the Punjab across the mountains north to the Mooztagh range. This extensive collection of Indian fossils, together with the still larger collection presented by Capt. Cautley, now forms one of the distinguishing characteristics in the Palæontological Gallery of the British Museum.

From 1843 to 1847 Falconer remained in England. He occupied this time in publishing numerous memoirs on the geology and fossil remains of the Sewalik Hills, which appeared in the Transactions of the Geological Society, and in the Proceedings of the Zoological Society, and of the Royal Asiatic Society. He also communicated several important papers on botanical subjects to the Linnean Society, of which may be specially mentioned that on *Aucklandia Costus*, the Cashmeer plant which yields the *Kostos* of the ancients; and that on *Narthex Assafœtidæ*, which was the first determination of the plant, long contested among botanists, which yields the assafœtida of commerce. He had found it growing wild in the valley of Astore, one of the affluents of the Indus.

But his main work at this time was the determination and illustration of the Indian Fossil collection presented by Captain Cautley and himself to the British Museum and to the East India Company. The bulk of the specimens were still imbedded in matrix. Sir Robert Peel's Government gave a liberal grant to prepare the materials in the national museum for exhibition in the Palæontological Gallery. Falconer was entrusted with the superintendence of the work, and rooms were assigned to him by the trustees in the British Museum. At his instance and under his superintendence a series of casts of the most remarkable of the Sewalik fossils was prepared and presented by the Court of Directors of the East India Company to the principal museums in Europe. Under the patronage of the Government and of the East India House an illustrated work was also brought out, entitled "Fauna Antiqua Sivalensis." In less than three years there appeared nine parts of this work, each containing twelve folio plates, executed in a style rarely equalled and never surpassed. No fewer than 1123 specimens are figured in these plates; and of many specimens three, four, or five different views are given. Besides the Sewalik fossils proper, the 'Fauna Antiqua' includes illustrations of a very valuable and important series of mammalian remains from the pliocene deposits of the valley of the Nerbudda, together with illustrations of the miocene fauna of the Irrawaddi, and of Perim Island in the Gulf of Cambay. The letter-press of the work did not keep progress with the plates; and at the close of 1847, before the arrears could be brought up, Dr. Falconer was unfortunately compelled, by the expiration of his leave, to return to India, where he found it impossible to continue the work by correspondence at a distance from the specimens. It is hoped, however, that the manuscript notes and memoirs which he has

left behind will form a complete key to this great work on Indian Palæontology.

On his return to India in 1848, Dr. Falconer was appointed Superintendent of the Calcutta Botanic Garden, and Professor of Botany in the Medical College. In 1850 he was deputed to the Tenasserim Provinces to examine the teak forests, which were threatened with exhaustion from reckless felling and neglected conservation. His report, suggesting remedial measures, was published by the Bengal Government. In 1852 he published a memoir recommending the introduction into India of the quinine-yielding Cinchonas, and indicating the hilly regions in Bengal and the Neilgherries in Southern India as the most promising situations for experimental nurseries. Some years afterwards the Cinchona was introduced from South America, and it is now thriving in India. In 1854, assisted by his friend the late Mr. Henry Walker, he undertook a 'Descriptive Catalogue of the Fossil Collections in the Museum of the Asiatic Society of Bengal,' which was published as a distinct work in 1859. In the spring of 1855 he retired from the Indian service.

On his return to England he resumed his palæontological researches, and in 1857 he communicated to the Geological Society two memoirs "On the Species of Mastodon and Elephant occurring in the Fossil state in England." Besides attempting to discriminate with precision the three British fossil elephants, till then confounded under the name of *Elephas primigenius*, Dr. Falconer produced for the first time a Synoptical Table, showing the serial affinities of all the species of *Proboscidia*, fossil and living, then known, of the former of which a large number had been either discovered or determined by himself. In the same year he published an account of the remarkable Purbeck mammalian genus '*Plagiaulax*,' discovered by Mr. Beckles near Swanage. In 1860 he communicated a memoir to the Geological Society "On the Ossiferous Caves of Gower," explored or discovered by his friend Lieut.-Col. Wood. The existence of *Elephas antiquus* and *Rhinoceros hemitœchus* as members of the cave-fauna was then for the first time established, and the age of that fauna precisely defined as posterior to the boulder-clay, or period of the glacial submergence of England. In 1862 Dr. Falconer communicated to the British Association at Cambridge an account of *Elephas melitensis*, the pigmy fossil elephant of Malta, discovered, with other extinct mammals, by his friend Captain Spratt, C.B., in the ossiferous cave of Zebbug. This unexpected form presented the Proboscidia in a new light to naturalists. Further researches on the general questions concerning the same family appeared in a memoir published in the 'Natural History Review' in 1863. Among many notes and papers which never appeared during his life-time may be mentioned a most important memoir "On the European Pliocene and Post-pliocene species of *Rhinoceros*," which, it is hoped, will shortly be published. In this memoir it is shown that there are four distinct pliocene and post-pliocene species of *Rhinoceros*, three of which have long been confounded by Cuvier and other palæonto-

logists under the name of *R. leptorhinus*. One of these, *R. leptorhinus* (*R. megarhinus* of Christol.) has no bony nasal septum; two, *R. Etruscus* (Falc.) and *R. hemitœchus* (Falc.), or *R. leptorhinus* (Owen), have a partial bony nasal septum; while the fourth, *R. antiquitatis* (Blumb.) or *R. tichorhinus* (Cuv. & Fisch.), has a complete bony nasal septum.

While exploring the Himalayahs in his early days, Falconer's attention had been closely directed to the physical features which distinguished them from mountain-ranges in temperate regions, and more especially to the general absence from their southern valleys of the great lakes so common in corresponding situations in the Alps. When the hypothesis of the excavation of lake-basins by glacial action was brought forward, he took a share in the discussion, and combated the view by an appeal to the contradictory evidence furnished by the Himalayahs, the lakes of Lombardy, and the Dead Sea.

For nearly thirty years Dr. Falconer had been engaged more or less with the investigation of a subject which has lately occupied much of the attention both of men of science and of the educated classes generally, viz. the proofs of the remote antiquity of the human race. In 1833, fossil bones procured from a great depth in the ancient alluvium of the valley of the Ganges in Hindostan were erroneously figured and published as human. The subject attracted much attention at the time in India. It was in 1835, while the interest was still fresh, that Dr. Falconer and Captain Cautley discovered the remains of the gigantic miocene fossil tortoise of India, which by its colossal size realized the mythological conception of the tortoise which sustained the elephant and the world together on its back (Geol. Trans. 2nd ser. vol. v. 1837, p. 499). In the same formations as the *Colossochelys* the remains were discovered of a smaller tortoise, identical with the existing *Emys tectum*. About the same time also several species of fossil *Quadrumana* were discovered in the Sewalik Hills, one of which was thought to have exceeded the Ourang-outang, while another was hardly distinguishable from the living "Hoonuman" monkey of the Hindoos. Coupling these facts with the occurrence of the camel, giraffe, horse, crocodiles, &c. in the Sewalik fauna, and with the further important fact that the plains of the valley of the Ganges had undergone no late submergence, and passed through no stage of glacial refrigeration, to interrupt the previous tranquil order of physical conditions, Dr. Falconer was so impressed with the conviction that the human race might have been early inhabitants of India, that he was constantly on the look out for the upturning of the relics of man, or of his works, from the miocene strata of the Sewalik Hills. In April 1844 he wrote thus to his friend Captain Cautley:—"Joining the indication given by the Hindoo mythology with the determined fact of the little *Emys tectum* having survived from the fossil period down to the present day, I have put forward the opinion that the large tortoise may have survived also, and only become extinct within the human period. *This is a most important matter in reference to the history of man.*" The same

view was publicly announced at the Zoological Society and the British Association in 1844.

Ten years later Dr. Falconer resumed the subject in India, while investigating the fossil remains of the Jumna. In May 1858, having the same inquiry in view, he communicated a letter to the Council of the Geological Society, which suggested and led to the exploration of the Brixham cave, and the discovery in it of flint-implements of great antiquity associated with the bones of extinct animals. In conjunction with Professor Ramsay and Mr. Pengelly he drew up a report on the subject, which, communicated in the same year to the Councils of the Royal and Geological Societies, excited the interest of men of science in the case. Following up the same object, he immediately afterwards proceeded to Sicily to examine the ossiferous caves of that island, and there discovered the "Grotta di Maccagnone," in which flint-implements of great antiquity were found adhering to the roof-matrix, mingled with remains of hyænas now extinct in Europe. (Quart. Journ. Geol. Soc. 1859.) Thus in 1859 the subject of the antiquity of the human race, which had previously been generally discredited by men of science, was launched upon fresh evidence. Since then it has been actively followed up by numerous inquirers, and Dr. Falconer himself was contemplating, and had indeed actually commenced, a work 'On Primeval Man.' In 1863 he took an active share in the singularly perplexed discussion concerning the human jaw of Moulin-Quignon; and in the conference of English and French men of science held in France, he expressed doubts as to the authenticity of the specimen, but in that guarded and cautious manner which was characteristic of him. In the spring of 1864 he published a notice on the remarkable works of art by "primeval man," discovered by Messrs. Lartet and Henry Christy in the ossiferous caves of the Dordogne; and in September he accompanied his friend Mr. Busk to Gibraltar, to examine caves in which marvellously well-preserved remains of man and mammals of great antiquity had been discovered. A joint report of this expedition by himself and Mr. Busk was afterwards published.

But his valuable life was drawing to a close. In January 1865 he was seized with a severe attack of acute rheumatism, from which he had formerly suffered in Cashmeer, and which on the 31st of the same month terminated fatally.

At the time of his death Dr. Falconer was a Vice-President of the Royal Society, and Foreign Secretary of the Geological Society; and as a proof of the high esteem in which he was held by his many friends, it may be mentioned that the sum of nearly two thousand pounds has been collected for founding a Fellowship in Natural Science in the University of Edinburgh, to be called "The Falconer Fellowship," and for the execution of a marble bust which has been presented to the Royal Society.

From what has been said, it is obvious that Falconer did enough during his life-time to render his name as a palæontologist immortal in science; but the work which he published was only a fraction of what he accom-

plished. The amount of scientific knowledge which perished with him was very great, for he was cautious to a fault; he always feared to commit himself to an opinion until he was sure that he was right; and he died in the prime of life and in the fulness of his power. Lovers of science and those who knew him well can best appreciate his fearlessness of opposition when truth was to be evolved, his originality of observation and depth of thought, his penetrating and discriminating judgment, his extraordinary memory, the scrupulous care with which he ascribed to every man his due, and his honest and powerful advocacy of that cause which his strong intellect led him to adopt: they also have occasion to deplore the death of a staid adviser, a genial companion, and a hearty friend.