FOSSIL INVERTEBRATE COLLECTIONS FROM INDIA AND PAKISTAN IN THE BRITISH MUSEUM (NATURAL HISTORY)

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ABSTRACT—The pioneers of Indian geology were largely British army officers, surgeons and missionaries, many of whom were ardent collectors of fossils. Their collections were mostly sent to England, where they were described by foremost specialists and have eventually found their way to the British Museum. The Museum has constantly received additional material from India and Pakistan, and the present paper lists the invertebrate collections now available for consultation, indicating to what extent they include type and other historical material.

ONCE the study of the sedimentary rocks and their fossils became firmly established on a scientific basis during the first two decades of the 19th Century, the investigation of Indian geology did not lag far behind that of European countries. The pioneers in this work, all amateurs, were largely British army officers, surgeons, and missionaries. In the first category were Sir W. E. Baker, Sir P. T. Cautley, J. Franklin, C. W. Grant, T. J. Newbold, W. Smee, Sir R. Strachey, and N. Vicary; in the second, H. J. Carter, H. Falconer, A. Fleming, J. G. Gerard, J. Hardie, and H. W. Voysey; and, in the third, S. Hislop and R. Hunter. Many of these were ardent collectors of fossils, and some of the richest Indian fossil localities were soon discovered. Part of the material collected was sent to England, where men like H. T. Colebrooke and Sir Roderick Murchison were keenly interested in the progress of the work; and arrangements were made for its description by foremost specialists, such as J. de C. Sowerby, E. Forbes, A. d'Archiac, and J. Haime. Some of the early works on Indian fossils, such as Sowerby's descriptions and illustrations of the Jurassic and Tertiary fossils of Cutch (1840) and Forbes' account of the Cretaceous invertebrates of S. India (1845) were contributions to palaeontological knowledge of considerable importance, in some cases more comprehensive than contemporaneous works on British fossils.

The specimens described in the majority of works on Indian fossils published prior to the inauguration of *Palaeontologia Indica* in 1861 remained in London, and were mostly incorporated in the collection then maintained by the Geological Society of London. Some material, however, found its way to other British institutions (for example, much of Fleming's Salt Range collection went to the Royal Scottish Museum, Edinburgh, and most of Strachey's Spiti collection to the Geological Survey Museum). Eventually, the Indian geological specimens in other London institutions were transferred to the British Museum—those of the Indian Museum in 1879, those of the Geological Survey in 1880, and the Geological Society's collection in 1911. The British Museum itself has constantly received collections of Indian fossils from the time of T. Hardwicke (whose ammonites from the Spiti Shales were figured by J. E. Gray in 1832) onwards, and even in recent years has had some notable additions of such material.

It has seemed that it might interest palaeontologists in India to know what invertebrate material from India and Pakistan is housed in the British Museum (Natural History). Below, therefore, is given a list of the more important collections, under the names of the collectors or donors, the extent to which each includes historical material being indicated. It has not been possible to include a list of type and figured specimens, but the "List of Type and Figured Specimens in the Collection of the Geological Society of London", by C. D. Sherborn and J. F. Blake, published by the Society in 1902, includes a large series from India, transferred to the British Museum (Natural History) in 1911. This list is referred to below as "Sherborn and Blake, 1902".

BABINGTON, B., Quaternary marine mollusca from a well at Madras, presented (to Geol. Soc.) 1818. Mentioned by donor, 1819, *Trans. Geol. Soc.*, **5,** p. 337.

BAKER, W. E., (Sir), Large collection of Eocene, Miocene and Pleistocene invertebrates from Sind, presented 1849, and 1855. Some corals described by P. M. Duncan, 1864, *Ann. Mag. Nat. Hist.* (3), **13,** pp. 295-307 (types listed Sherborn and Blake, 1902, p. 55).

BLAGRAVE, T. C., Large collection of Eocene, Oligocene and Miocene invertebrates from Sind, presented (to Geol. Soc.) in 1846. The source of many of the specimens described by d'Archiac and Haime, 1853–4, *Anim. foss. Groupe nummulit. Inde.* Some corals described by P. M. Duncan, 1864, *Ann. Mag. Nat. Hist.* (3) **13,** pp. 295–307. (Types listed Sherborn and Blake, 1902, pp. 44-51, 55.) A few mollusca described by Cox, 1931, *Proc. Malac. Soc.*, **19,** pp. 177–187, including genus *Blagraveia;* and 1931, *Trans. R. Soc Edinb.*, **57,** pp. 25–92.

BLAKE, J. F., Large collection of Jurassic invertebrates from Cutch, acquired by the Museum in 1907. Cephalopods discussed by L. F. Spath, 1924, *Pal. Ind.*, N.S., **9,** Mem. 1. Many cephalopods and lamellibranchs described by Spath, 1927–33, *Pal. Ind.*, N.S., **9,** Mem. 2, and by Cox, 1940 and 1952, *Pal. Ind.*, ser. 9, **3,** parts 3, 4.

BURMAH OIL CO. LTD., Type and other specimens of the cirripede *Arcoscalpellum hartleyi* Withers, from the Miocene of the Arakan Coast, E. Bengal, presented 1935 —see T. Withers, 1936, *Ann. Mag. Nat. Hist.* (10) **18,** p. 590; also 1953, *Catalogue of Fossil Cirripedia* (Brit. Mus. Nat. Hist.), **3,** p. 232. Large collection of Lower Tertiary mollusca from Pakistan, presented 1950; described by F. E. Eames, 1951–2, *Phil. Trans. R. Soc.*, **235,** no. 627, and **236,** no. 631.

CARTER, H. J., Small collection of Cretaceous invertebrates from Bagh, presented (to Geol. Soc.) about 1880. The Carter Collection of foraminifera, presented to the Museum 1882–9, includes Eocene specimens from Sind, Cutch, and Kelat, Baluchistan, described, 1853, *Ann. Mag. Nat. Hist.* (2) **11,** pp. 161–171; also 1861, *ibid.*, (3) **8,** pp. 366–382, 446–470; also Eocene specimens from the Rajpipla Hills, S. of the Narbada River.

CAUTLEY, P. T., (Sir), Mollusca from the Inter-trappean beds of the Central Provinces, presented about 1840.

CLARKE, H. and N. WALLIC ., A few ammonities from the Spiti Shales, presented (to Geol. Soc.) 1822.

COLEBROOKE, H. T., Ammonites from the Spiti Shales, presented (to Geol. Soc.) 1825. See also D. Scott.

COOK, H., Liassic ammonites and echinoids from Kelat, Baluchistan, presented (to Geol. Soc.) about 1861. Referred to, Carter, 1862. *Journ. Bombay Br. R. Asiatic Soc.*, **6,** p. 190; also Spath, 1936, *Ann. Mag. Nat. Hist.* (10) **17,** pp. 641-5 (*Sphenarpites hawkinsi* gen. et sp. nov.); also H. L. Hawkins, 1922, *Geol. Mag.*, **59,** p. 213 (*Pseudopygaster eos* gen. et sp. nov.). Eocene foraminifera from Kelat sent by Cook to Carter were acquired by the Musuem with the latter's collection.

DAVIES, L. M., Several collections of Eocene foraminifera from Pakistan, presented from 1923-48 and including specimens described by donor in 1926, *Rec. Geol. Surv. Ind.*, **59,** pp. 237-253; 1927, *Quart. Journ. Geol. Soc.*, **83,** pp. 260-289; 1930, *Trans. R. Soc. Edinb.*, **56** (2); 1932, *ibid.*, **57** (2); and 1940, *Quart. Journ. Geol. Soc.*, **96,** pp. 199–228. Eocene echinoidea from Pakistan (unfigured syntypes of *Conoclypeus pilgrimi*), presented 1926.

Lower Eocene mollusca and corals from the Samana Range, duplicates from collection described 1930, *Pal. Ind.*, N.S., **51,** presented 1929. Eocene mollusca from Pakistan, presented in 1931 and 1937; some specimens described by Cox, 1931, *Trans. R. Soc. Edinb.*, **57,** (1) ; 1938. *Ann. Mag. Nat. Hist.*, (1) **1,** pp. 161-177. Lower Eocene ostracods from Pakistan, presented 1938; described by M. H. Latham, 1938, *Proc. R. Soc. Edinb.*, **59,** pp. 38–48. Eocene echinoids from the Kohat-Potwar basin, Pakistan, presented 1940; described by donor, 1943, *Quart. Journ. Geol. Soc.*, **99,** pp. 63–76.

FLEMING, A., Carboniferous, Permian, Jurassic and Eocene invertebrates from the Salt Range, referred to by donor, 1853, *Quart. Journ. Geol. Soc.*, **9,** pp. 189–200. Most of the material was presented to the Geol. Soc. about 1853, but some brachiopods were kept by T. Davidson, whose

collection was acquired by the Museum in 1886. Eocene specimens were included in material described by d'Archiac and Haime, 1853–4, *Anim. foss. Groupe nummulit. Inde* (figured specimens listed Sherborn and Blake, 1902, pp. 44–51). and a few were described by Cox, 1931, *Trans. R. Soc. Edinb.*, **57,** (1). Carboniferous and Permian brachiopods described by T. Davidson 1861, *Quart. Journ. Geol. Soc.*, **18,** pp. 25–33 and other invertebrates from the Upper Palaeozoic and Trias by L. de Koninck, 1863, *ibid.*, **19,** pp. 1–19 (Sherborn and Blake, 1902, p. 54, list a few figured specimens). The following types of Davidson, 1861, were acquired with the Davidson Coll.—*Terebratula flemingi* (Pl. 1, figs. 1*a-c*, 2), *T. subvesicularis* (Pl. 1, fig. 4), *Retzia radialis* var. *grandicosta* (Pl. 1, fig. 5), *Streptorhynchus crenistria* var. *robustus* (Pl. 1, fig. 16), *Productus costatus* (Pl. 1, fig. 20). Most figured specimens, not in London bre in the Royal Scottish Museum, Edinaurgh, (See also W. Purdon.)

Fox, Cyril, (Sir), Small collection of Jurassic invertebrates from Jaisalmer, Rajputana, presented in 1948.

Fox, F. G. Brook, Eocene mollusca from "between Warcha Mine and Sakesar Peak, Salt Range", and Carboniferous brachiopods from the Salt Range, presented in 1896.

Fraser, E. G., Eocene mollusca from the Salt Range, acquired in 1910 with the H. G. Seeley Coll.

Geological Survey of India, Several series of duplicate specimens, presented subsequent to publication of monographs in *Pal. Indica*. Tertiary corals from Sind (1881); Tertiary echinoids from Sind (1885, also, another set presented to the Geol. Soc.); Jurassic echinoids from Cutch (1893); Jurassic corals from Cutch (e. 1900); Jurassic crinoids from Cutch (1915); Triassic ammonites from Kashmir (1926); Jurassic brachiopods from Cutch (1929); Permo-Carboniferous brachiopods from the Salt Range (1933, *per* the Sedgwick Museum).

Gerard, J. G., A few ammonites from the Spiti Shales were presented by Gerard to the Geol. Soc. in 1820. A few of Gerard's mollusca from the Spiti Shales were acquired in 1935 with the residue of the Sowerby Coll. Most of Gerard's collection, however, is divided between the Oxford University Museum and Calcutta.

Gill, W. D., Foraminifera (*Assilina*) from the Lower Eocene of Pakistan, presented 1953; described by Gill, 1953, *Contrib. Cushman Found. Foram. Res.* **4** (2); Foraminifera and echinoids from the Eocene of the Punjab Salt Range, presented 1954; described Gill, 1953, *Journ. Paleont.*, **27,** pp. 824–844.

Godwin-Austen, H. H., Carboniferous brachiopods and Upper Jurassic belemnites from Kashmir, presented (to Geol. Soc.) about 1864; brachiopods described by T. Davidson, 1866, *Quart. Journ. Geol. Soc.*, **22,** pp. 39–45 (figured specimens listed Sherborn and Blake, 1902, p. 56). A further series of Palaeozoic invertebrates from Kashmir, presented to Museum in 1888. Mollusca from the Inter-trappean beds of the Central Provinces, bequeathed 1924.

Grant, C. W., Jurassic and Miocene invertebrates from Cutch, presented (to Geol. Soc.) 1837, also a small series presented direct to the Museum; described by J. de C. Sowerby, 1840, *Trans. Geol. Soc.* (2) **6,** pp. 327–9 and Explanations of Pls. 21–26 (figured specimens catalogued Sherborn and Blake, 1902, pp. 34–7). A few of the Jurassic fossils re-described by Cox, 1940 and 1952, *Pal. Ind.*, ser. 9, **3,** pts. 3, 4.

Hardwicke, T., Ammonites from the Spiti Shales collected by Hardwicke and figured by J. E. Gray, 1832, *Illustrations of Indian Zoology*, pl. 100, are in the *Museum* (see Crick, 1898, *Type and Figured Specimens of Fossil Cephalopoda in the Brit. Mus.* (*Nat. Hist.*), pp. 22, 26, 29.

Hislop, S. and Hunter, R., Fossil invertebrates from the Inter-trappean beds of Nagpur and Rajahmundry, presented (to Geol. Soc.) about 1859; described by Hislop and Murray, 1860, *Quart. Journ. Geol. Soc.*, **16,** pp. 166–189. Also, the phyllopod species *Estheria managaliensis* and *E. kotahensis*, from the Gondwanas, described by T. R. Jones, 1862, *Monograph of Fossil Estheriae*. Types listed by Sherborn and Blake, 1902, pp. 23, 52–3.

Another series of Inter-trappean fossils was presented by Hislop direct to the Museum in 1859, and a further series was acquired in 1897 as part of the R. Hunter bequest. The Museum also has the type specimen of the ostracod species *Candona kotahensis* Jones (1862), from the Middle Gondwanas, probably acquired with the Hislop Coll.

KAYE, C. T. and C. E. CUNLIFFE, Upper Cretaceous invertebrates from Pondicherry, presented (to Geol. Soc.) in 1843; described by E. Forbes, 1845, *Trans. Geol. Soc.* (2) **7,** pp. 97–174 (figured specimens listed Sherborn and Blake, 1902, pp. 40–44). A few specimens were re-described by F. Stoliczka, 1868–71, *Cretaceous Fauna of S. India* and by Kossmat, 1895, *Beitr. Pal. Geol. Öst.-Ung. u. Orients*, **9.**

KING, W., Presented Upper Cretaceous Nautiloids from Trichinopoli in 1889 and *Syringosphoera* from Karakoram in 1890.

KOKEN, E., Collection of Permian invertebrates, including many brachiopods, from the Salt Range, acquired in 1905.

JONES, T. RUPERT, Eocene invertebrates from Sind (probably collected by a correspondent), presented (to Geol. Soc.) at an unrecorded date; a few described by Cox, 1931, *Trans. R. Soc. Edinb.*, **57,** pp. 25–92. (Indian foraminifera in the Museum in 1882 were included in Jones's *Catalogue of Fossil Foraminifera in the British Museum (Natural History)*, of that date, pp. 61–66, but it is uncertain if any were acquired from Jones.)

LEIGH, H. P. P., Danian and Eocene invertebrates from Fort Monro, Sulaiman Range, presented 1908.

MALCOLMSON, J. G., Inter-trappean fossils from the Deccan, presented (to Geol. Soc.) 1837; described by J. de C. Sowerby, 1840, *Trans. Geol. Soc.* (2) **5,** Explan. of Pl. 47 (type specimens listed Sherborn and Blake, 1902, p. 38).

MARSHAM-TOWNSEND, R., (Hon.), Upper Cretaceous mollusca from S. India, presented in 1877.

MATLEY, C. A., Upper Cretaceous invertebrates from the Trichinopoli district, presented 1925. Invertebrates from the Lameta (Infra-trappean) beds of the Central Provinces, presented (Percy Sladen Trust) 1934. Permo-Carboniferous brachiopods from Umaria, Rewa State, Central India, presented 1935.

PINFOLD, E. S., Jurassic mollusca and brachiopoda from the Attock district of the Punjab, presented 1935 (a series largely duplicating that described by L. R. Cox and H. M. Muir-Wood, 1935-7, *Pal. Ind.*, N.S., **20,** Mems. 5, 6 and including a few specimens there figured by Muir-Wood). Eocene invertebrates from Waziristan, presented (Steel Bros. and Co. Ltd.) 1936. A large series of Eocene foraminifera from the Punjab Salt Range. duplicates from collection described by L. M. Davis and E. S. Pinfold, 1937, *Pal. Ind.*, N.S., **24,** Mem. 1. Mollusca and polyzoa from the Permian of the Salt Range, presented 1949.

PURDON, W., Carboniferous brachipods from the Salt Range and N. E. Himalayas, described by Davidson, 1861, *Quart. Journ. Geol. Soc.*, **18,** pp. 33–34. Some of the specimens described were incorporated in the Davidson Coll., acquired by the Museum in 1886. The following figured specimens are now in the Museum—*Spirifera moosakhailensis* (Pl. 2, fig. 2), *S. lineata* (Pl. 2, fig. 3), *Camarophoria purdoni* (Pl. 2, fig. 4), *Productus purdoni* (Pl. 2, fig. 5), *P. humboldtii* (Pl. 2, fig. 6), *Aulosteges dalhousi* (Pl. 2, fig. 7), *Strophalosia morrisiana* (Pl. 2, fig. 8).

ROCKE, Eocene invertebrates from Sind, presented (to Geol. Soc.) 1868; a few specimens described by Cox, 1931, *Trans. R. Soc. Edinb.*, **57,** pp. 25–92.

ROGERS, A., Eocene invertebrates from the Rajpipla Hills, S. of the Narbada River, presented in 1868.

SCOTT, D., Miocene (Upper Gaj) fossils from Karaibari, Brahmaputra River, E. Bengal, presented (to Geol. Soc. *per* H. T. Colebrooke) about 1825; referred to by Colebrooke, 1822, *Trans. Geol. Soc.* (2) **1,** p. 135, and (briefly) by Vredenburg, 1921, *Rec. Geol. Surv. Ind.*, **51,** p. 331.

SINOR, K. P., Permo-Carboniferous brachiopods from Umaria, Rewa State, Central India, presented 1931.

SKINNER, B. M., Eocene invertebrates from the Tochi River district, North-West Frontier Province, presented 1904.

SMEE, W., Jurassic invertebrates from Cutch, presented (to Geol. Soc. *per* W. H. Sykes) in 1836; described by J. de C. Sowerby, 1840, *Trans. Geol. Soc.* (2) **5,** *Explan.* of Pl.61 (figured specimens listed Sherborn and Blake, 1902, pp. 38-39).

STODDARD-, Invertebrates from the Intertrappean beds of Rajahmundry, presented (to Geol. Soc.) about 1860.

STRACHEY, R., (Sir), Palaeozoic, Triassic and Jurassic invertebrates from Niti, N. Himalayas, transferred in 1880 from the Geological Survey Museum ; described by J. W. Salter and H. F. Blanford, 1865, *Palaeontology of Niti*. Also a collection of duplicate specimens presented (to Geol. Soc.) in 1863.

SYKES, W. H., Eocene invertebrates from Sind, presented 1857; a few specimens described by Cox, 1931, *Trans. R. Soc. Edinb.*, **57,** pp. 25–92. See also W. Smee.

TOWNSHEND, F. W., Large collection of nodules enclosing invertebrates of Upper Tertiary age, from the beach off Ormara headland, Makran (C. Birley bequest, 1907); described by R. B. Newton and others, 1905, *Geol. Mag.*, pp. 293-319.

VICARY, N., Eocene invertebrates from the Mari Hills, Baluchistan, and from Subathu, presented (to Geol. Soc.) 1846, referred to by J. Morris, 1846, *Quart. Journ. Geol. Soc.*, **2**, pp. 266–7, and Vicary, 1853, *Quart. Journ. Geol. Soc.*, **9,** pp. 70–73. Included in material described by d' Archiac and Haime, 1853–4, *Anim. foss. Groupe nummulit. Inde* (figured specimens listed Sherborn and Blake, 1902, pp. 44–51). A few specimens described by Cox, 1931, *Trans. R. Soc. Edinb.*, **57,** pp. 25–92.

WAGER, L. R., Upper Palaeozoic invertebrates from the Lachi Ridge, N. Sikkim, presented 1933; duplicates from the collection described by K. P. Oakley and H. M. Muir-Wood, 1941, *Pal. Ind.*, **31,** Mem. 1.