Historical Series

VOLUME 17 NUMBER 1 25 MAY 1989

The *Bulletin of the British Museum (Natural History)*, instituted in 1949, is issued in four scientific series, Botany, Entomology, Geology (incorporating Mineralogy) and Zoology, and an Historical series.

The Historical Series is edited in the Museum's Library
Librarian: Mr R. E. R. Banks
Editor: Miss P. Gilbert

Papers in the *Bulletin* are primarily the results of research carried out on the unique and ever-growing collections of the Museum, both by the scientific staff and by specialists from elsewhere who make use of the Museum's resources. Many of the papers are works of reference that will remain indispensable for years to come.

A volume contains about 256 pages, made up of two numbers: published Spring and Autumn. Subscriptions may be placed for one or more of the series on an Annual basis. Individual volumes and back numbers can be purchased and a Bulletin catalogue, by series, is available. Orders and enquiries should be sent to:

Sales Department,
Natural History Museum Publications,
British Museum (Natural History),
Cromwell Road,
London SW7 5BD

Telephone: 01-938-9386
Telex: 929437 NH PUBS G
Fax: 01-938-8709

World List abbreviation: *Bull. Br. Mus. nat. Hist* (hist. Ser.)

ISBN 0 565 09011 9
ISSN 0068 2306

British Museum (Natural History)
Cromwell Road
London SW7 5BD

Historical Series
Vol 17, No. 1, pp. 1–165

Issued 25 May 1989

Typeset by J & L Compositions, Filey, North Yorkshire
Printed by Henry Ling Ltd. at the Dorset Press, Dorchester, Dorset

Bull. Br. Mus. Nat. Hist. (hist. Ser.) 17(1): 1–165 Issued 25 May 1989

Notes on Insects, 1692 & 1695 By Charles duBois

Edited with an introduction by
L. JESSOP
Department of Entomology, British Museum of Natural History, Cromwell Road, London SW7 5BD

CONTENTS

INTRODUCTION

Entomology in the seventeenth century is most commonly exemplified in the modern mind by Mouffet's *Theater of Insects*. That work, with its wealth of superstitions and ridiculous remedies, provides a strong reinforcement of modern prejudices about the inadequacies of past scientists, yet in reality it is atypical of the entomological scene of the times when it was published. When both manuscripts and serious published works of the period are examined, what is constantly surprising is the straightforward, common-sense approach of most of the naturalists of the time: John Ray, for instance, wrote to Hans Sloane in April 1699 (*teste* Lankester, 1898)

> The most I have done is in observing the generation and transmutations of the papilionaceous tribe, of which I have found at least 200 species near my own habitation, *needum finitae*, every year bringing new ones to my knowledge. Of these, as many as I could get the eggs or caterpillars of, I have fed and endeavoured to bring to their changes, though I have failed in many. This hath taken me up no small time and pains.

Apart from the archaic language, these sentences may well have been written by a naturalist of the late twentieth century.

The notebook reproduced here belongs to the tradition of John Ray rather than Thomas Mouffet. It is the work of Charles duBois, who is now chiefly remembered as a botanist and horticulturalist. When he wrote the work, duBois was a reasonably wealthy London merchant involved in the silk trade, and he was then in his mid thirties. His social circle at the time he was writing probably already included several of the leading naturalists on the London scene, whose activities seem to have been as much social as scientific.

Why duBois wrote the notebook is not known: it may have been an attempt to define what he knew of the insects as a whole or of the insect fauna local to Mitcham, but there was probably also an additional element of enjoyment in drawing the figures that

accompany the descriptions; considerable time must have been spent in their production, and they are of fine quality. These notes may originally have been intended for publication (although there is no evidence of such an intention). If so, duBois may have deferred to Petiver and to Ray, who was in 1695 working towards his *Historia Insectorum*.

It must be remembered that at the time the notebook was written there were no identification guides available of the sort that we have now. In the absence of books to help him, it is probable that duBois turned to other naturalists for assistance—men such as James Petiver, for instance, who contributed a specimen that is figured in the notebook, kept his own insect collecting diary and published some of his collecting records in the *Monthly Miscellany* and elsewhere.

The present work reproduces duBois' text in facsimile and as a transcript, and transcripts are also appended of his surviving correspondence. A summary is given of what is known about Charles duBois' life and times. This summary has no pretentions to being complete: there are probably a number of further references to the man buried among the mass of letters in the Sloane MSS and in the Journal Book of the Royal Society, and there may be further information to be gleaned from census and tax records in the Public Record Office. A detailed account drawing on all sources was thought inappropriate to this publication, which is primarily concerned with presenting the text of the notebook.

The Spelling, and Possible Pronunciation of duBois' Name:

In his letters and will Charles duBois always signed his name with a lower case *d* and without a space between the *u* and *B*, and this usage is followed in the present publication. Other authors have given the name as Dubois or Du Bois, and their orthography is followed when the text of works is cited.

A note on the verso of Add. MSS 22,851 f.186 spells the name as Du Boys. If this was written by someone who had heard the name but not seen it written, it could be an indication of how it was pronounced.

References to Entries in the Notebook

Where entries in the notebook are discussed below, they are numbered according to their place in the various sections. Thus 'notes 5' is the fifth entry in the notes section, 'Papilio 9' the ninth in the genus Papilio, and 'Tunbridge Wells 4' the fourth species described from Tunbridge Wells.

LIFE OF CHARLES DUBOIS

The following account is broadly based on that of Foster (1924: 113–124). Unfortunately, Foster did not provide references to many of his sources of information, and his account is here taken at face value. Where additional information has been obtained in the course of the preparation of the current work or where facts quoted by Foster have been checked to their source, the source is cited.

Background

Charles duBois belonged to a Huguenot family that had already been living in England for at least two generations. He was the eldest son of John (aka Jean) duBois, who described himself in his will as citizen and weaver of London (P.R.O. 11/378 [169 Hare]). Charles' date of birth is usually given as 1656 (Foster, 1924 claimed it was 1653): his gravestone indicates that he was 83 years old when he died, which was on the 20 or 21 October 1740, and that places his date of birth between the 22 October 1656 and the 19 October 1657. No record of baptism has been traced.

The records of L'Eglise de Londres in Threadneedle Street report a marriage on the 11 January 1652 between Jean duBois, son of Jean, native of Canterbury and Anne Herle, daughter of Charles Herle, 'Ministre de la Parolle de Dieu', native of Winwick in the County of Lancaster. Anne Herle was probably Charles' mother, and she must have died while he was still a boy, since his father re-married in 1662. Foster (1887) in a register of London marriage licences recorded that John duBois of the parish of St Mary Aldermanbury, a widower aged 40, took out a licence on the 10 September to marry Sarah Waldo, a spinster aged 22, daughter of Anne Waldo, of All Hallows, Honey Lane, London, widow, who consented, the marriage to take place at All Hallows aforesaid, or St Faith, London (dated 10 Sept. 1662). It would appear that the marriage took place neither at All Hallows nor at St Faith, as the register of L'Église de Londres (Threadneedle Street) records the marriage occurring there on 27 July 1662. John duBois was still described as a native of Canterbury, and Sarah Waldo as daughter of Daniel Waldo, native of London.

There are seven sons and one daughter mentioned in John duBois' will.

The Waldo family had been living in England since the mid sixteenth century and contained several wealthy merchants among its members (Jones, 1863). The only Waldo listed in the 1666 hearth tax records for All Hallows Honey Lane was Edward, a mercer of the Streete Syde, who was taxed for seven hearths (P.R.O. E179 252/32). A note in the same set of records says that there was no collection in St Mary Aldermanbury because the collector was 'appointed to begin his collection on Monday the 3rd day of September, 1666 but was prevented by the fire'.

The duBois and Waldo families could probably be classed as fairly wealthy members of the London community. The parishes they lived in were themselves well-to-do areas of the city (St Mary Aldermanbury had been described by Stow in 1603 as follows: 'In this Alderman bury streete be diverse faire houses on both the sides, meete for marchants or men of Worship, and in the midst thereof is a fayre Conduit'), whilst the seven hearths of the Waldo household is a mark of substantial prosperity, as is the situation of their house (not in a yard or lane, but in a street) (see Power in Beier & Finlay, 1986, for a discussion of indicators of wealth in seventeenth century London). Their profession was not unusual: about 20% of the population of the city was employed in the cloth trade at that time (Beier in Beier & Finlay, 1986), about half of those listed in the All Hallows Honey Lane parish in the 1666 hearth tax return being silkmen (P.R.O. E179 252/32).

Charles duBois himself later also joined the cloth trade, being bequeathed in his father's will a share in a mercer's business and the silk trade. These businesses were also part-owned by his father's brother, also called Charles (P.R.O. wills 11/378 [169 Hare]).

Charles duBois' knowledge of the silk trade is implied in the description of the species 'notes 43', the tail of which he describes as being 'large and very hairy, blunt at the end like that of the papilio of a silk worm'.

Assuming that Charles duBois spent his childhood in London, among his early memories would have been the outbreak of plague in 1665, which killed almost one-fifth and incapacitated up to one-third of the population of London (see Slack in Beier & Finlay, 1986) and the great fire of 1666, which destroyed almost all of the City of

London, including the whole of the parishes of St Mary Aldermanbury and All Hallows Honey Lane. Unfortunately no evidence relating to his early life has yet come to light, the earliest record of his existence being in 1684, when he was mentioned in his father's will, at which time he would have been about 28 years old. Presumably he was then already occupied somehow in the cloth trade, as he was considered fitted by his father to take over part of the family business on his death.

No evidence has been found of Charles duBois having married.

John duBois and Politics

John duBois is known to have been involved in the political life of the City of London. In 1682 there was a political struggle between the Royal Court and the Whigs, who were determined to exclude the Duke of York from the succession. It was felt by the Court that it was important that the government of the City of London should be in sympathetic hands. In the election of two Sheriffs, John duBois and Thomas Papillon (who were probably old friends, both being chosen in 1657 by the French Church in London to remonstrate with the committee appointed by Cromwell to settle disputes in that body) were nominated by the Whigs in opposition to two candidates favoured by the Lord Mayor (who supported the Court). The candidates were presented to the citizens on Midsummer Day, and as the meeting was in the favour of the Whig candidates, the Lord Mayor declared the meeting adjourned. The citizens, ignoring the order of adjournment, declared Papillon and duBois elected.

This election was declared void and a fresh one ordered, which resulted in Papillon and duBois again being returned, but the Lord Mayor ignored the decision and announced that the two Court candidates had been chosen.

In February 1684, Papillon and duBois issued writs against the Lord Mayor for making a false return, and on his refusing to enter an appearance, he was arrested and detained in custody for six hours. After the action had been abandoned, the Mayor retaliated by claiming £10,000 damages for false imprisonment. The trial took place under the notorious Chief Justice Jeffreys, who secured a verdict for the full amount claimed. Papillon fled to Utrecht until the Revolution made it safe for him to return to London. The Lord Mayor would probably then have turned his attention to duBois, but by that time the latter was dead: his burial is registered at the parish church of St Mary Aldermanbury on the 30 October 1684 and his will was proved on the 5 November.

John duBois was elected a Committee of the East India Company in 1681 (Committee was the title given to each of the 24 directors elected annually by the East India Company to manage its affairs), possibly through the influence of Papillon, who was Deputy Governor and at that time fighting the Tory section of the Company. Papillon was replaced as Deputy Governor by Robert Thomson in 1682 and retired in 1683, but John duBois remained a Committee until his death.

John duBois' Sons and the East India Company

In April 1691 John duBois' son, also called John, became a Committee of the East India Company. He had married in July 1690, and the licence describes him as 'about 25', which would place his date of birth at about 1665 and thus make him the step-brother of Charles. John duBois the younger remained a member of the Court of the Company for six and a half years, and on 30 September 1697 was appointed to the post of Cashier-General (usually called Treasurer) at a salary of £200 plus £100 a year gratuity. This appointment necessitated his retirement from the Court of the Company.

John duBois the younger died in 1702, and on 27 October 1702 Charles duBois was appointed to the post of Cashier-General. Charles duBois gave security of £4,000 for the faithful discharge of his duties.

A Charles duBois was a Committee from April 1698 until 1709, but unless he was given permission to continue in that post at the same time as being Treasurer, this must have been a second person with the same name.

During the tenure of John duBois the younger, and of Charles duBois as Treasurer, the East India Company underwent tremendous difficulties. The following sequence of events is taken from Hunter (1908):

1691 Enemies of the Old East India Company formed an association allied to the Whigs in Parliament, to break the monopoly of trade.
1693 Sir Josia Child, by bribes 'on the most lavish scale', procured a trading charter from the Crown.
1694 The House of Commons passed a resolution that all the subjects of England have a right to trade with the East Indies unless prohibited by Act of Parliament.
1695 An inquiry into bribery and corruption concerning the affair ruined several politicians.
1698 An association constituted by an Act of Parliament, the 'General Society' (also known as the New Company), was granted exclusive trade with the East Indies, saving the rights of the Old Company, which were due to expire in 1701.
1698 The Old Company subscribed £315,000 in the name of John duBois to the New Company, thus giving them a major interest in it.

There followed a bitter struggle between the Old and New Companies, both in England and India.

1702 Under pressure from Crown and Parliament the two companies were forced into a union.
1708 The union was made absolute.

The only reference to these struggles in Charles duBois' surviving manuscripts can be found in the letter he wrote to Governor Pitt in September 1702 (Add. MSS 22,851, ff.184–185—see appendix).

Some records exist of Charles duBois' salary (IOR H67). In 1710 he was paid £200 a year, and in 1725 £200 salary plus £100 gratuity. His standing in the Company can be deduced from the fact that in 1710 only two home officers were paid a higher salary: the Secretary (£240) and the Accomptant General (£250). Foster (1924) mentions that on 27 March 1723 Charles duBois was given a gratuity of 500 guineas and on 8 March 1732 a similar amount, with an allowance of £50 a year for house rent.

Further indicators of the wealth of the duBois family are that at the time of the union of the two companies Charles duBois held stock to the value of £2,885 12s., while almost £5,000 worth of stock was held by three of his step-brothers.

The final amalgamation of the Old and New Companies required a reconsideration of the officers employed, but Charles duBois must have proved satisfactory, as he was confirmed in his post on 29 May 1709.

In addition to his position as Treasurer of the United Company, Charles duBois was one of the seven Trustees of the Old Company, becoming sole trustee in 1736 on the death of the only other Trustee then surviving, Edward Gibbon.

Financial Scandals

In the later years of his life, Charles duBois was involved in two financial scandals in his work for the East India Company.

First, on 5 August 1730, the Chairman announced at a General Court that six of the supercargoes of the fleet lately returned (including Charles' nephew, Waldo duBois, who was third supercargo) had been found to have conspired to falsify their accounts, despite the fact that 'the chief supracargo might fairly and honestly gain upon the success of one voyage from eight to ten thousand pounds, and the rest in proportion'. An action brought against the culprits in the Court of Chancery resulted in them paying the Company almost £15,000.

On 12 June 1734 the Committee of the Treasury of the Company reported that they had found a deficiency in the cash of about £11,000, arising from the officers' practice of taking buyers' notes instead of cash in clearing goods (despite strict orders to the contrary) and of lending money to officials of the East India Company. Charles duBois and a clerk named Tullidge (who seems to have been chiefly responsible) were examined, and Tullidge was suspended. Charles duBois was acquitted of dishonesty, but was found guilty of lack of supervision and dereliction of duty in not acquainting the Court of the Company with the state of affairs.

On 24 July 1734 a general court was held, at which a memorial from Charles duBois was read, pleading his great age (he was now about 78) and long service. He placed all blame on Tullidge, declaring that the latter had, four years back, without his knowledge accepted notes from merchants to an amount between £30,000 and £40,000, and that on discovering this he had been frightened to disclose the facts in case the position of the debtors should be irretrievably shaken and the money lost to the company altogether. He had himself managed to get in the greater part of the amount, and the total deficiency would not much exceed £3,000. Further, he declared that although £60,000,000 had passed through the treasury during his tenure, he had never drawn any illicit profit, and that in the year of the South Sea crash he had saved the company many thousands. His employers were merciful, and accepted £300 from him in full discharge of his liability. That his position in the Company was not compromised is shown by a gratuity of £150 given to him in December 1737 and another one in April 1740.

duBois and Mitcham

In his will, John duBois senior bequeathed to Charles 'my house and land in Micham in Surrey with all the appurtenances thereunto belonging except the furniture in the best chamber there which I give & leave to the disposal of my executor' (P.R.O. 11/378 [169 Hare]). Mitcham at the turn of the eighteenth century appears to have been a pleasant area. It was described by Aubrey (1718: 142) as being 'situate about nine miles from London, and well inhabited, and much frequented by the citizens of our Metropolis'.

The house was situated on the south side of Upper Green East, and the grounds were about 15 acres in extent. The original house was pulled down towards the end of the eighteenth century, and replaced by another (The Firs), which has also been demolished, the site currently (1987) being occupied by a number of houses and shops. The boundary of the Firs site is clearly shown in the Ordnance Survey 25 inch:1 mile map of 1867.

Charles duBois was verified in the Mitcham vestry minutes of 18 June 1738 as being entitled in his own right to a pew in the north aisle of the parish church which the owners and occupiers of his house had enjoyed 'since time immemorial' (Surrey Record Office, Court Rolls of the Manor of Biggin and Tamworth: *teste* E. N. Montague, per. comm.).

THE DU BOIS TOMB

He is remembered for his generosity in donating £200 for the purchase of Queen Anne's Bounty to augment the meagre income of the vicar of Mitcham (Jones, 1863).

Charles duBois lies buried in the family grave in Mitcham churchyard (Church Road, Mitcham) close by that of the Waldos on the north side of the church: his will specified that he should be buried on the side of the church 'where the fewest graves are' (P.R.O. 11/705 [264 Browne]). The inscription on the tomb slab indicated that he died '20 Oct. A.D. 1740, aetat. 83' (although the *Gentleman's Magazine* for 1740 (p. 525) says the death was on the 21 October). The tomb stone was also inscribed with the names of Waldo duBois (his brother's son, who died on 20 February 1746), Ebeneezer duBois (Charles' stepbrother, who died on 14 April 1747) and Sarah Charlotte duBois (his niece, who died on 12 April 1757—not to be confused with the Sarah Waldo who married Humphrey Sibthorp and who died on 1 August 1756). A figure of the grave was given in Foster (1924), and is reproduced above. Foster described the inscriptions as being barely legible and the slab as being broken into six pieces: in 1987 only two of those pieces could be located, one being face-down on the ground beside the grave and the other (bearing part of Sarah Charlotte's name and eulogy) lying at an angle on the grave site.

In 1716 the court baron of the Mitcham manor of Biggin and Tamworth was notified of the death of Mary duBois, and approved the admission of her son Charles as a tenant of the manor holding land in 'the Commonfield of Mitcham called Blacklands'. This seems to indicate that a second Charles duBois was living in the area at that time (E. N. Montague, pers. comm.). It is not known which man leased from Mary Batt in 1736 'two parcels of customary land containing by estimation 10 acres more or less called Blowers or Cold Blows formerly in the occupation of Philip Gardner'.

The Mitcham Garden

In Loudon (1838: 62–63) is a reference to an account prepared by the Society of Gardeners, which indicates duBois' importance as a horticulturalist. It says that duBois 'has ... not only been very industrious to procure plants from abroad, but also as generous in communicating whatever his garden would afford, as also many useful observations relating both to their culture and uses.' Loudon also gave a brief account of the state of duBois' garden in Mitcham in 1835, and listed some of the trees planted by him that still remained: a very large weeping willow; a nettle tree, with branches covering a space 50ft in diameter and a trunk 6'8" in circumference; a pinaster with a clear trunk about 40ft high and a girth 3ft from the ground 9ft, and a total height of 60ft; an old, large and handsome mulberry tree, the branches of which covered a space 60ft in diameter; very old and large scots pines [hence the name of the house built on the site]; a very large stone pine; a large Prunus *Mahaleb*; a fine *Ptelea trifoliata*; a stag's born sumach, with a trunk 6ft in girth, and an old *Bignonia radicans* and a large *Arbutus* (names as given by Loudon).

Anon (1812) claimed that duBois 'was a great and celebrated botanist, and had an excellent botanic garden to his house on the upper green, where the fair is kept, at Mitcham, in Surrey', and Lambert's manuscript note about famous gardens (MS in the library of the Linnean Society of London) says that duBois had 'a Great Collection of stove plants &c in great perfection' (stove plants are plants that were grown in heated houses).

duBois' reputation as a *botanic* gardener is indicated by entries in the minute books of the Royal Society reporting that he was being given batches of imported seeds to raise and then reporting back to the Society on his success (two entries seen: 1 March 1698/9, and 3 December 1701). Perhaps another indication of his standing is the dedication to him of the third decade of Bradley's *Historia Plantarum Succulentarum* in 1725.

It would appear from Peter Collinson's letter to William Byrd II in 1730 (from a contemporary transcription in the Westover manuscripts, Virginia Historical Society, *teste* Dr A. W. Armstrong) that Charles duBois carefully observed different methods of cultivation, and passed his observations on to others. Collinson says:

> I will close this long relation with an observation of a very curious gentleman Mr Charles Dubois who in his travels thro' the South parts of France & Spain was very agreeably entertained in their gardens from variety of fruits growing together being regularly planted with cherries apples & pears and against every tree grew a vine which run up into the tree and was supported by its branches, & when he was there, was plentifully hung with fruit, and ripen'd to great perfection and a moderate skill in pruning served.

A little can be deduced about duBois' garden from his insect notebook. For instance the references to 'The Rasps' (Musca quadripennis 1, Musca 5 & 15 and notes 28 & 36), 'Currans' (Scarabeus 14, Musca 7, Musca 15, Vespa 2 and Notes 1), an apple tree (Scarabeus 32), cherry leaves (Apis 4), 'Aprecock Leaves' (Musca 13 and notes 8) and a gooseberry bush (Scarabeus 29) indicate that he probably grew those fruits. Scarabeus 8 is described as being taken on a rose. Scarabeus 1 and 3 were taken whilst digging the ground in September, Scarabeus 24 out of new-dug earth in April, and the chrysalis of Phalaena 25 out of new-dug earth at the beginning of June. Thysanoptera (notes 29) are described as being associated with hot-beds. Scarabei aquatici 1 was taken in water in a pond, and this could have been the pond in the garden marked on the 1867 Ordnance Survey map. The garden probably also contained a water tub (Scarabeus 10), a woodshed (Phalaena 28) and an outside privy ('necessary house', notes 33).

Scientific and Social Activities

Towards the end of the seventeenth century, there was a group of naturalists in the London area, who possessed a considerable body of knowledge about natural history. It is unfortunate that because they published very little about their activities and findings, their knowledge perished with them, and as a corollary many of these figures now lie in relative obscurity. Several of these naturalists were of a similar age: for instance, Joseph Dandridge (baptised 1664); James Petiver (born 1663); William Sherard (born 1659); Adam Buddle (born approx. 1660); Sir Hans Sloane (born 1660); Samuel Doody (born 1656); and of course Charles duBois (born ca 1656). Leonard Plukenet, who was born in 1641, was slightly older than the others.

Fortunately a lot of the private correspondence of the participants in the natural history scene of that time found its way into the vast assemblage of papers now known as the Sloane manuscripts, and in recent years some historians have researched into these papers and presented interpretations of the activities of some of Charles duBois' contemporaries. Pasti (1950) (a doctoral thesis, a copy of which is in the BMNH), for instance, studied one of duBois' known associates, William Sherard, and Stearns (1952) summarised the life and activities of another associate, James Petiver. Pasti's work in particular contains much information on the naturalists of that time.

The activities of the group of friends included meetings in coffee houses (Sloane MSS 4067, f.7), where they are known to have examined botanical specimens (Sloane MSS 4037, ff.102–103), and in taverns (Sloane MSS 4066, f.283–284). They also made botanical excursions (e.g. to Chislehurst bogg: Sloane MSS 4066, f.283).

The group of naturalists was referred to by Pasti and Stearns as the Temple Coffee House Club, and as the Temple Coffee House Botany Club, but there is no evidence of contemporary use of these names. It was Pasti who first discovered the existence of a club at the Temple Coffee House, the earliest certain reference to which is in a letter from William Vernon to Sloane dated July 1698 (Sloane MSS 4037, ff.102–103) in which Vernon says that he will bring a collection of plants every Friday night to be discussed. Only one other letter so far discovered (Sloane MSS 4067, f.7: undated) refers to a club at the Temple Coffee House.

Stearns claimed that duBois was a member of the Temple Coffee House Botany Club, the evidence cited for this being Sloane MSS 4067, f.81 and Sloane MSS 4020, f.107 (the mayoral permit that allowed duBois and several friends to travel to Gravesend on a Sunday) (see appendix for text). Sloane MSS 4067, f.81 is a letter from Petiver to Breynius, dated Christmas eve, 1692, and includes the sentence 'Yesternight att a Meeting of Botanick ffriends, amongst whom were present y^{e} Ingenious Dr Plukenett, Dr Sloan, Dr Robinson, Mr Newton, Mr Doody, Mr Dale, Mr Du-Bois &c, who all dranke & wisht y^{r} health.' As neither of these letters refer either to a club or to the Temple Coffee House, there is no firm evidence presently known that proves duBois was a member of that club.

Other than the letters cited in the appendix and Sloane MSS 4067, f.81 (quoted above) the only references to Charles duBois' participation in the scientific life of the group that have so far come to light are three letters cited in Nichols (1817):

> Mr Tilleman Bobart was with me; and presently came Mr Maningham, with Mr Rand; and soon after that, Mr Dubois and my Brother. It is the first time so many (for there are few more) have met together since I came into England . . . we remembered all our Botanic Friends. (10 May 1710. William Sherard to Richard Richardson)

> I fear Mr Dubois has suffered as much as others. Not having been at Mitcham all the winter, till within this ten days, having been long ill: I called in on him this evening,

> and was told he was returned much better, but was lain down. (28 March 1721. Sherard to Richardson, discussing gardens)
>
> Dr Dillenius . . . is to go to Mitcham to view what Mr Dubois has. (Dillenius was preparing a book on Lichenes, Musci &c) (7 December 1721. Sherard to Richardson)

Apart from the insect notebook presented here, which is dated 1692 and 1695, there is no evidence of Charles duBois' involvement in these activities before his letter to Sir Hans Sloane dated 29 May 1697 (Sloane MSS 4036, f.316: see appendix).

An analysis of the Sloane correspondence, Collinson (1766) and Nichols (1817) as well as the duBois insect notebook provides us with a list of some of the naturalists of that time who were Charles duBois' acquaintances. The known names are: Tilleman Bobart, Joannes Philippus (aka Jacobus) Breynius, Peter Collinson, John Cox, Samuel Dale, James (?=Joseph) Dandridge, Dr J. J. Dillenius, Samuel Doody, Richard Fildon, Rev. Thomas Maningham, Joseph Miller, James Newton, James Petiver, Leonard Plukenet, Isaac Rand, Richard Richardson, Tancred Robinson, William Sherard and his brother James, Sir Hans Sloane, William Stonestreet and John Verdy. The only one of these scientific associates mentioned in Charles duBois' will was Isaac Rand, who was bequeathed £10, but as his profession (apothecary) was stated in the will, he may have served the duBois family in a professional capacity, as did Sloane (Sloane MSS 4056, f.62—see appendix).

duBois' friends outside the scientific world must have included men of considerable power, as in 1702 he described Robert Harley, then Speaker of the House of Commons, and Sir Francis Wyndham as being 'both my very kind friends' (Add. MSS 22851, f.186 [see appendix]). Foster (1924) noted that a Charles duBois attended the funeral of Samuel Pepys in June 1703 and was given a ring value 15 shillings, but there is no evidence that it was this Charles duBois.

duBois provided observations to John Ray, as Ray (1724: 364) includes the statement: *Violae caninae varietatem, si non speciem diversam observavit D. Du-Bois . . . Maio mense in pascuis circa Mitcham.* There is, however, no evidence that the two men ever met, although they did have mutual friends, e.g. Petiver & Sloane (see Raven, 1942 for information on Ray's associates), nor that he met Dr Buckley, who sent him curiosities from India (Add. MSS 22851, f.184–185 [see appendix]).

The Introduction of Rice to Carolina

Collinson (1766) gives an account of the introduction of rice into the (then) British colony of Carolina. It reads:

> In the year 1696, my sagacious friend *Charles Dubois*, then [sic] treasurer to the *East India Company*, told me often with pleasure, that he first put the *Carolinians* on the culture of rice.
>
> He happened one day, in that year, to meet *Thomas Marsh*, a *Carolina* merchant, at the coffee house, to whom he said, I have been thinking, from the situation, nature of the soil, and climate, that rice may be produced to great advantage in *Carolina*: But says *Marsh*, how shall we get some to try? Why, says *Dubois*, I will enquire for it amongst our *India* captains.—Accordingly, a money bag full of *East India* rice was given to *Marsh*, and he sent it to *South Carolina*; and in the year 1698, he told his friend *Dubois*, that it had succeeded very well.

A briefer account of Collinson's recollection is to be found in a draft letter from Collinson to Samuel Eveleigh dated 22 April 1737 (in the library of the Linnean Society, *teste* Dr A. W. Armstrong), which reads:

> Mr Dubois, Treasurer to the E. India Comp, who is yett Living, has Several times told Mee that att the request of Mr. Marsh a Marchant He Procur'd for him a Hundred pound Money bag of Rice to send to Carolina . . .

Foster (1924) claims, however, that it was not Charles duBois but his step-brother John who was responsible for the introduction of rice to Carolina. It is of course possible that Charles utilised John's influence in the East India Company to help him in his scheme and John thus obtained some of the credit.

It should be noted that rice *did* succeed very well in Carolina (see Collinson, 1766), but that further introductions were initially necessary before it became properly established.

duBois and the Royal Society

Charles duBois was elected a Fellow of the Royal Society in 1700. At that time, election to Fellowship was not an honour conferred usually upon exceptionally outstanding scientists as it is now, but seems to have been open to anyone with a serious scientific interest.

An index exists for entries in the Journal Book of the Royal Society up to the year 1700. Those concerning duBois are as follows:

> 13 April 1698: 'Mr Cha^{s}, Dubois presented an entire Cocode Maldivia [?Coco de Mer, *Lodoicea maldivica*] for which great rarity it was ordered y^{t} he should have the thanks of the Society and that Mr Hunt should make an Exact Draught of it to represent it in sev^{l} postures and y^{t} it sl^{d} be carefully preserved in ye Repository.'
>
> 1 March 1698/9: It was reported that seeds from the East India collection had been examined by Sloane and given to Dr Uvedale, Mr Doudy [= Doody?], the Bishop of London, the Duchess of Beaufort, Mr Dubois and Mr Bobart, who would try to grow them and report back to the Society on their success.
>
> 30 November 1700: 'Mr Charles Dubois, Capt. Edmund Hally and Mr John Chile of Oxford were also ballotted & Chosen Members of the Society.'
>
> Another entry has been seen in the Journal Book, dated 3 December 1701: a report that seeds from Virginia were to be divided between the 'Duchess of Beaufort, the Bishop of London, Dr Uvedale, Mr Waller, Mr Dubois and Mr Doody.'
>
> On 27 May 1714 it was reported that: 'Mr Charles DuBois some time since Chosen a ffellow of the R.S. being put to the ballot his Eleetion was Confirmed, and being present sealed the Bond paid his Admission money Subscribed the obligation and was Admitted a Fellow of the R.S.' It is not clear why duBois waited 14 years between election and admittance.

The Genus *Duboisia*

The genus *Duboisia* (Scrophulariaceae) was described by Robert Brown (Brown, 1810). It has been claimed (e.g. in the Charles duBois entry in the *Dictionary of National Biography*) that *Duboisia* was named in honour of Charles duBois, yet there is no evidence in the original description to support the theory. Don (1838: 479) stated that *Duboisia* was named after Louis Dubois.

Charles duBois' Collections

In his will (P.R.O. 11/705 [264 Browne]), Charles duBois bequeathed to his brother-in-law Ebeneezer all of his books and also:

> all my Books of specimens of Dryed plants the cases and drawers in which the same are all my natural and artificial curiosities and samples of all my Roman and other coins and medalls and whatsoever shall be in my closet at Mitcham . . . or in the gardens there to be held and enjoyed by him . . . except and reserving unto my heire Sarah Charlotte duBois the liberty of taking to her own use such Books Coins and other curiosities in the said closet as she shall think fitt.

Concerning the library, several books are mentioned in the insect notebook and duBois' correspondence, but it is possible that he had seen some or all of these in the libraries of his friends. The only work that can be said with certainty to have been owned by duBois is Albin (1720) *A Natural History of English Insects*, as his name is among the list of subscribers.

The next mention of the collection was in Anon (1812), which comprises notes made by Mendes da Costa on collections of naturalists. Da Costa says of duBois that 'he had collections of shells, fossils &c of which I saw some at Mr Waldo's, junior, about 1760.' Presumably on the death of Ebeneezer duBois the Closet and its contents had passed on to the nephew Waldo duBois.

The present whereabouts of the Roman and other coins, books, shells, fossils etc. is not known: they may still exist or they may not, but the specimens of dried plants did survive and are now located in the collections of Oxford University, possibly being acquired by that institution through the influence of Sarah (grand-daughter of Samuel Waldo, Charles duBois' Stepmother's brother), who had married Humphrey Sibthorp, the Sherardian Professor of Botany in 1740 (Jones, 1863: 16).

The herbarium was described in detail by Druce (1928), who described the way in which it was badly treated under the direction of Professor Balfour. Druce also listed the British plants contained in the herbarium and some of the botanists who contributed specimens: most of the known British collectors of the period are represented as well as foreign botanists such as Pitton de Tournefort. Collections of plants from India and the Cape are mentioned as well as their collectors. The herbarium also contains specimens that Mark Catesby collected in America, which indicates that Charles duBois was one of those who provided the money for his expedition. He also subscribed to W. Houstoun's expedition to the Spanish colonies in the Americas in 1732 (Sloane MSS 4053, f.167).

Charles duBois contributed specimens of plants to the Sloane herbarium, and these are discussed by Dandy (Dandy, 1958). If duBois had a collection of preserved insects and if they had been incorporated in the Sloane collection, they would almost certainly have perished in the 'periodical bonfires of Sloanian specimens' held by W. E. Leach. By 1833 it was reported that 'literally not a vestige' remained of Sloane's insect collection (Stearn, 1981: 205–206).

Charles duBois' Character

It is usual in biographies to give some indication of the character of the person portrayed. In the case of Charles duBois there is not much on which to base a character analysis: his correspondence reveals very little about his private life, and he did not commit to paper any of those violent differences of opinion that generally cast light on historic personalities.

Although Charles duBois often signed his letters as 'your humble and obedient servant', it is to be doubted that this was any more than a formula: letter-writers of the seventeenth and eighteenth centuries had no more humility and obedience than twentieth century writers have sincerity or fidelity. No portrait is known to exist, so we cannot read his character from his features.

The contemporary references to duBois' character are few. Petiver calls him his 'worthy friend' (Sloane MSS 2347 item 77), while Peter Collinson refers to him as 'a very curious gentleman'; curious in those days meaning full of curiosity, not implying strangeness as it does today (letter to William Byrd II, 1730 in Virginia Historical Society) and on another occasion calls him 'my sagacious friend' (Collinson, 1766).

Because of the frequent references in his correspondence to meetings (at Coffee Houses or Drinking Houses or at the houses of his friends), Charles duBois leaves an overall impression of being a fairly 'clubable' character, yet it should be remembered that there is only a handful of such references in a life span of 83 years.

Foster (1924) painted the following pen-picture:

> To myself I figure him as a kindly old gentleman in spectacles, riding down from London on a Friday evening, and reining in his nag to a walk as the lavender fields of Mitcham come into view; or later on, seated in his library over a cup of tea, telling his niece the news of the town and turning over the leaves of a botanical treatise to settle some question which has occurred to him during his journey; or next morning, in a shabby coat and with a bandanna handkerchief tied round his head, pottering about his sunny garden and in and out of his greenhouses, marking the progress of his latest importations and scribbling additions to his notes.

Attractive as such a romantic picture of the man is, we should not forget that there is no evidence to support it.

To the present editor, the deepest insight into Charles duBois' character is the phrase that occurs in the last paragraph of his will (P.R.O. 11/705 [264 Browne]), which was dated 29 April 1737, three years before his decease. It says: 'and now heartily and sincerely forgiveing all and every person whatsoever that have in any way injured me I most humbly recommend my Soul unto thy hands.' What is most telling is not that he is remembering his friends, as most people would at such a time, but at the last remembering his enemies kindly. This marks him as an essentially good man.

NOTES ON THE MANUSCRIPT

Introduction

The manuscript reproduced here in facsimile is now located in the Entomology Library of the British Museum (Natural History), where it has the press mark S.B.o D.12 A. Notes on the first and last pages indicate that the work was purchased from Professor J. Percival of 'Leighton', Shinfield Green, Reading, Berks by the British Museum (Natural History) on the 28 February 1945 for £4.00. The history of the manuscript is otherwise unknown. Professor John Percival (1863–1949) worked at the University of Reading between 1902 and 1932 where he was first lecturer in, and later Professor of Agricultural Botany (obituary by Brierly, 1949).

The authorship of the manuscript was anonymous until 1986, when work on editing it for publication began. There are two indications supporting the belief that it is the work

of Charles duBois: first, the handwriting, which agrees strongly with that contained in his autograph letters, and secondly, there is an entry in James Petiver's collecting diary (not the work of James Plukenet, as claimed by Hammond, 1975—the handwriting is definitely that of Petiver) which says '77 Papilio aurora marmorea oculata ... This I caught Sept 23. 1695 going to my worthy Friends Mr Ch: Du-Bois's at Mitcham ...' (Sloane MSS 2347). This last entry agrees with Papilio 9 of the present notebook, which was reportedly 'given me by M^{r} Petiver 23th September who took it y^{e} Same day coming to Mitcham'.

In 1986 the pages of the work were thick and hard, having been at some time painted with starch, but in that year they were treated to remove the starch: that process also resulted in the writing becoming a little fainter. The book was also disbound (it was not at that time in its original binding) and currently comprises single sheets, the exception being the two folios containing the sideways-written notes, which are joined together. It is the intention of the British Museum (Natural History) Entomology Library to have the book rebound in the near future.

The manuscript comprises 64 folios of Charles duBois' work and a title page added later by a different hand, which is also reproduced here. Some comments on the contents of the work by an unknown hand are associated with the manuscript, but are not reproduced here. Also not reproduced are the 20 sides that are completely blank.

The folios are sized 145 mm by 181–183 mm in the first part of the work (as it was found in 1986) and from the folio beginning with Notes 14 to the end of the work the pages are sized 145 mm by 186 mm. The manuscript is in sepia coloured ink on cream coloured paper, and is reproduced here in slightly greater contrast than the original. A small part of the manuscript, for instance the page containing Scarabeus 33–35, is in blacker ink.

At one stage, when the work was ordered as it was found in 1986, the pages have been numbered, a number being written in pencil at the bottom right hand corner of alternate sides.

The order of the pages in 1986 did not present a logical progression of notes, and the order has been re-arranged in the present work. There is no evidence that the sequence of pages then or now is as Charles du Bois intended.

The order as bound was:

Papilio 1–12
Tunbridge Wells 4–5
Tunbridge Wells 1–3
Muscae quadripennes 1–3
Musca 12–17
Scarabeus 1–41
Scarabei aquatici
Pseudo-Scarabei
Gryllotalpa
Notes (sideways) 28–31
Notes (sideways) 21–33
Apis 1–4
Cimex
Musca 1–11
Palaena 1–30
Notes 1–20
Notes 34–79
Vespa 1–10
Miscellany thoughts about vegetables.

The manuscript is capable of division into four parts:

1. Notes upon Insects, which contains 79 entries, and is dated 1692–1695. One part of these notes is written sideways, and does not interpolate well with the other pages (note 20 is on the reverse of a page starting with note 34, so the sideways-written notes cannot be inserted in numerical order).
2. Several sections of descriptions of insects arranged systematically by genus, but not systematically within genus.
3. Descriptions of five insects collected in Tunbridge Wells

4. Miscellany thoughts about vegetables.

Some species occur twice in the notebook, once in *Notes* and once under their genus. Where this is the case there is a spot of ink present at the end of each line of text of *Notes*, and in some cases a vertical line is drawn through the text. This, and the general untidiness of *Notes* when compared to the sections arranged systematically leads naturally to the conclusion that *Notes* was a rough piece of work that was later re-organised, the generic arrangement being the final version. It is not clear, however, why some of the species were re-worked and some were not.

In the present work the generically-arranged section is presented first, in the order: Papilio; Phalaena; Scarabeus; Scarabei aquatici; Pseudo-Scarabei; Gryllotalpa; Muscae quadripennes; Musca; Vespa; Apis; Cimex.

This section is followed by the five Tunbridge Wells specimens, then *Notes* and finally the miscellaneous thoughts on vegetables.

Places and Dates of Capture

The year of capture of individual species is not known, except for the indication of 1692 and 1695 on the first page of *Notes*, and for Papilio 9, which the Petiver collecting diary (Sloane MSS 2347) confirms was caught in 1695.

The dates in the diary are not those of the modern calendar, as 11 days were omitted from the year 1752 in order to bring the British into line with the Julian calendar. All of the dates in the diary are therefore 11 days later in the modern calendar (1 April old style is equivalent to 12 April new style). In duBois' time, the New Year began on the 25 March, which is why some of the dates given in correspondence written early in the year are given two years, e.g. 2 February 1712/3 (Sloane MSS 4065, f.100)—this date would be the 13 February 1713 new style.

The places of capture given in the notebook are as follows: between London and Mitcham (Papilio 9); by the riverside (Papilio 11 and Scarabeus 11); Tunbridge Wells Common (Tunbridge Wells 5 and Phalaena 19); the Lane near East Field [now Eastfields Lane, Mitcham?] (Musca 14 and Phalaena 26); Greenwich town (Scarabeus 9); in the street in London (Scarabeus 40); the gravel pits (Scarabeus 41); 'about our house in London' (Pseudo-scarabeus); 'in my brother's garden at Hackney' (Musca 1) and Mr Stonestreet's house at Carshalton (Phalaena 26).

It is probable that most of the remaining specimens were collected in the vicinity of Mitcham, but it should be borne in mind that there is no concrete evidence for that assumption.

Literature mentioned in the Manuscript

Notes 57 and 60 mention Dni Hook Micrograph. This is: Hooke, R. 1665. *Micrographia: or some physiological descriptions of minute bodies made by magnifying glasses.*

Notes 29 and Phalaena 13 mention Mouffet, and question its accuracy. Mouffet is quoted in Latin and not English, which may indicate the edition duBois used: Mouffet, T. 1634. *Insectorum sive minimorum Animalium Theatrum*, not the 1658 translation.

Pseudo Scarabei mentions Swammerdam. This is: Swammerdam, J. 1669. *Historia Insectorum generalis.*

Apis 1 (Bombylius) mentions Purchas's Theatre of flying insects. Anno 1657. This is: Purchas, S. 1657. *A Theatre of politicall Flying Insects. Wherein especially the nature . . . and the manner of right-ordering of the Bee, is discovered and described.*

duBois' Assumptions

Part of the attraction of old works is the amusement to be gained from the sometimes outlandish assumptions and prejudice they contain. Thence the continued attraction of works such as the bestiaries and Mouffet's *Theater of Insects*.

The duBois manuscript contains little that is ridiculous: it is a work of sound common sense about a mundane (rather than exotic) subject, and there are no unicorns or other fantastic beasts. Probably the only outlandish notion in the notebook is that the head of the caterpillar is that end which is the tail of the butterfly (Phalaena 14). This notion is not original, for it is contained in Mouffet's discussion of silk moths where he says: 'This is a pleasing thing and worthy to be noted, that the head of the Silk-worm, makes the tail of the butterfly in that golden coloured metamorphosis, and the tail the head; which also happeneth in all other catterpillars that are changed into an Aurelia.' The belief possibly arose from seeing the head of the butterfly emerging from the free end of a hanging pupa, and assuming that head end of the caterpillar attaches to the pupation site (whereas in fact they attach by the tail end). The belief had already been refuted by Ray in 1660, who says (translation by Ewan and Prime): 'It will not be proper (for the matter can be easily observed) to draw attention to the mistake which Moufet and others make in asserting that the head of the caterpillar is changed into the tail of the moth: for in every caterpillar that I have seen the exact opposite is fact.'

Some of the instances where duBois leaves plain description and indulges in supposition are:

Papilio 8: The first pair [of legs are] plumose serving to brush the eyes and head I suppose.
Phalaena 25: the female soon lays her eggs whether she doth coire or not, though in this last case they are sterile.
Scarabeus 2: Perhaps this may be the female, which in most cases is the biggest.
Pseudo-Scarabei: It appears they grow after exclusion.
Notes 14: The mouth is like a lobster's claws, opening sideways and one going over the other so that it seems to be an insect of prey in armour.
Notes 26: Query if kin to the cuckoo spit (note that duBois does not describe the cuckoo spit bug—perhaps he thought it was too common to include).
Notes 49: This contrivance is to preserve the true wings from being wetted when they swim.

In some cases duBois questions his own identifications, or gives reasons for them. For instance, in the description of Musca 1 he says that the way of flying and looks of it would make one suspect it a bee, but that it has but two wings and a head of the make of a fly. This distinction between Hymenoptera and Diptera was probably made after he had described Notes 18 (which is hymenopteran) as a dipteran (*Musca vespoides . . .*).
The distinctions between Hymenoptera and dipterous mimics of Hymenoptera suggest that duBois was familiar with the notion of looking beyond superficial appearances and at the underlying structures of an animal when classifying it.

List of Determinations

The help of various members of the staff of the Entomology Department of the British Museum (Natural History) in arriving at the following determinations is gratefully acknowledged.

Abbreviations used in this section are: Dipt., Diptera; Col., Coleoptera; Hym., Hymenoptera; Lep., Lepidoptera.

Genus Papilionaeum (all Lepidoptera)

1 Nymphalidae. *Aglais urticae* (Small Tortoiseshell)
2 Pieridae. *Pieris rapae* female (Small White)
3 Satyridae. *Lasiommata megera* (Wall)
4 Nymphalidae. *Vanessa atalanta* (Red Admiral)
5 Pieridae. *Gonopteryx rhamni* (Brimstone)
6 Nymphalidae. *Polygonia c-album* (Comma)
7 Pieridae. *Pieris brassicae* (Large White)
8 Nymphalidae. *Cynthia cardui* (Painted Lady)
9 Lycaenidae. *Lycaena phlaeas* (Small Copper)
10 Satyridae. *Maniola jurtina* (Meadow Brown)
11 Satyridae. *Aphantopus hyperanthus* (Ringlet)
12 Satyridae. *Maniola jurtina* underside (Meadow Brown)

Genus Phalaenaceum

1 Lep., Pyralidae. *Hypsopygia costalis* (Gold Triangle)
2 Lep., Pyralidae. ? *Crambus perlella*
3 Lep., Pyralidae. ?? *Agriphila inquinatella*
4 Lep. indet.
5 Lep. indet.
6 Lep. indet.
7 Lep., Noctuidae. *Autographa gamma* (Silver Y)
8 Lep. indet.
9 Lep., Pterophoridae, *Pterophorus pentadactyla*
10 Lep. indet.
11 Lep., Pyralidae. ?? *Catoptria falsella*
12 Lep., Arctiidae. *Tyria jacobaeae* (Cinnabar Moth)
13 Lep., Zygaenidae. *Zygaena trifolii*, or *Z. lonicerae*
14 Lep., Hepialidae. ? *Hepialus lupulinus* (Common Swift)
15 Lep. indet
16 Lep., Noctuidae. *Acronuta psi*, or *A. tridens*
17 Lep., Hepialidae. *Hepialus humuli* female (Ghost Swift)
18 Lep., Pyralidae. ? *Aphomia sociella* female (Bee Moth)
19 Lep., Lymantriidae. ? *Euproctis chrysorrhoea* (Brown-Tail) or *Lymatria salicis*
20 Lep., Arctiidae. *Arctia caja* (Garden Tiger)
21 Lep., Noctuidae. *Agrotis exclamationis* male (Heart and Dart)
22 Lep., Noctuidae. ?? *Mythimna* species
23 Lep., Geometridae. *Xanthorhoe fluctuata* (Garden Carpet)
24 Lep., Geometridae. *Camptogramma bilineata* (Yellow Shell)
25 Lep. indet
26 Lep., Geometridae. *Timandra griseata* (Blood-vein)
27 indet.
28 indet.
29 indet.
30 indet.

Scarabinum Genus (all Coleoptera)

1 Carabidae. ? *Nebria brevicollis*
2 Carabidae. *Calathus fuscipes*
3 Carabidae. *Carabus* sp.
4 Chrysomelidae. *Timarcha tenebricosa*
5 Anobiidae. ? *Stegobium paniceum*
6 Elateridae. *Melanotus villosus*
7 Elateridae. ? *Athous haemorrhoidalis*
8 Cerambycidae. *Stenocorus meridianus*
9 Scarabaeidae. *Cetonia aurata*
10 Chrysomelidae. *Gastrophysa viridula*
11 Chrysomelidae. *Phaedon ?armoriciae*

12 Chrysomelidae. *?Prasocuris juncı*
13 Mordellidae. *Mordellistena abdominalis*
14 Cantharidae *Cantharis pellucida* or *C. nigricans*
15 Cantharidae. *Cantharis livida* or *C. cryptica*
16 Cantharidae. *Rhagonycha fulva*
17 Oedemeridae. *Ischnomera caerulea* or *Oedemera lurida*
18 Curculionidae. *Cionus* sp.
19 Coccinellidae. *Adalia bipunctata*
20 Scarabaeidae *Phyllopertha horticola*
21 Cerambycidae. *Clytus arietis*
22 Curculionidae. *Phyllobius ?pomaceus*
23 Tenebrionidae. *Blaps mucronata*
24 Carabidae. *Harpalus affinis*
25 ? Dermestidae (*Dermestes* sp.) or Anobiidae (*Xestobium rufovillosum*)
26 Coleoptera indet.
27 Scarabaeidae. *Aphodius* sp
28 Carabidae. *Notiophilus ? biguttatus*
29 Pyrochroidae. *Pyrochroa serraticornis*
30 Carabidae. *Pterostichus madidus*
31 Carabidae. *Cicindela campestris*
32 Curculionidae. *?Phyllobius argentatus*
33 Coccinellidae. *Adalia ?bipunctata* or *decempunctata*
34 Cerambycidae. *?Grammoptera ruficornis*
35 Tenebrionidae. *Cylindrinotus laevioctostriatus*
36 Tenebrionidae. *Cylindrinotus laevioctostriatus*
37 Chrysomelidae. *Gastrophysa viridula*
38 Scarabaeidae. *Melolontha melolontha*
39 Melyridae. *Malachius ?bipustulatus* or *viridis*
40 Silphidae. *Thanatophilus* species, probably *sinuatus*
41 Carabidae. *?Bembidion* species, or *Asaphidion* species

Scarabei aquatici

1 Col., Dytiscidae. Probably *Agabus* species

Pseudo-Scarabei

1 Dictyoptera. *Blatta orientalis*

Gryllotalpa

1 Orthoptera, Gryllotalpidae. *Gryllotalpa* sp., if British then *G. gryllotalpa*

Muscae quadripennes

1 Mecoptera, Panorpidae. *Panorpa* sp.
2 Neuroptera, Chrysopidae. *Chrysopa sens. lat*
3 Neuroptera, Chrysopidae. *Chrysopa sens. lat*

Musca (all Diptera)

1 Syrphidae. *?Lucozona lucorum, Volucella inflata* or *V. pellucens*
2 Syrphidae. *?Syrphus* sp.
3 Syrphidae. *?Syrphus* sp.
4 Syrphidae. *?Platycheirus* sp.
5 ?Sarcophagidae *?Sarcophaga*
6 Sarcophagidae. *Sarcophaga* sp.
7 Stratiomyidae *Sargus* sp
8 Syrphidae.
9 Syrphidae. *Eristalis tenax*
10 Stratiomyidae *?Beris* sp
11 Empididae. *Empis livida* male
12 Muscidae. *Helina* sp.
13 Diptera indet

14 Syrphidae. *Chrysotoxum cautum*
15 Dolichopodidae. *Poecilobothrus nobilitatus*
16 ?*Lucilia* (Calliphoridae) or Dolichopodidae
17 Syrphidae. *Rhingia campestris*

Vespinum genus

1 Hym., indet
2 Hym., indet
3 Hym., ?Myrmosidae. *Myrmosa*
4 Hym., Ichneumonidae
5 Hym., Ichneumonidae
6 Hym., Ichneumonidae
7 Hym., Ichneumonidae
8 indet.
9 Hym., Ichneumonidae
10 Hym., Ichneumonidae

Apinum genus

1 Hym., Apidae. *Bombus ?hucorum*
2 Hym., Apidae. *?Chelostoma*
3 Hym., Tenthredinidae. *?Athalia*
4 Hym., Chrysididae.

Genus Cimicinum

1 Hemiptera, Pentatomidae (immature).

Tunbridge Wells

1 Hym., Apidae. *Bombus* sp., *?lapidarius* or *ruderarius*
2 indet.
3 Lep., Pieridae. *Pieris napi* (Green-veined White)
4 Lep., Satyridae. *Pyronia tithonus* male (Gatekeeper)
5 Col., Geotrupidae. *Geotrupes ?spiniger* or *stercorarius*

Notes upon Insects &c.

1 Dipt., Empididae. *Empis tessellata* male
2 Lep., Geometridae (immature)
3 Lep. (immature)
3 (repeated number) indet
4 [Scarabeus 6]
5 Hym., Tenthredinidae.
6 [Scarabeus 18]
7 Lep., Noctuidae. *Cucullia verbasci* (Mullein)
8 Lep. (immature)
9 Dipt., Tabanidae. *Haematopota* sp., probably *H. pluvialis*
10 Hemiptera, conflation of aphids and typhlocybine Cicadellidae.
11 Lep., Cossidae. ?? *Zeuzera pyrina* (Leopard Moth)
12 [Phalaena 9]
13 indet.
14 [Vespa 1]
15 [Cimex 1]
16 [Musca 15]
17 [Scarabeus 13]
18 Hym., Tenthredinidae. *?Macrophya* sp.
19 [Scarabeus 17]
20 [Vespa 4]
21 [Scarabeus 21]
22 [Scarabeus 14]
23 [Scarabeus 15]
24 [Scarabeus 20]

25 Hym., Tenthredinidae *Nematus ribesii* (immature)
26 Hemiptera, Miridae *Lygocoris* sp.
27 indet., possibly the same as Notes 26
28 Col., Nitidulidae. *Meligethes aeneus*
29 Thysanoptera, Phlaeothripidae
28 (repeated number) Odonata, Libellulidae *Libellula depressa*
29 (repeated number) Odonata, ?*Platycnemis pennipes* (Platycnemididae), or Coenagrionidae
30 ?Diplopoda
31 ?Coleoptera
32 Col., Carabidae *Agonum dorsale*
33 Dipt., Anisopodidae. *Sylvicola fenestralis*
34 [?Vespa 5]
35 [?Vespa 4]
36 Hym., Tenthredinidae. ?*Tenthreda*
37 [Musca 10]
38 Dipt., Conopidae. *Myopa* sp., probably *M. testacea*
39 Dipt., Syrphidae. *Myolepta luteola*
40 Dipt., Syrphidae. *Chrysogaster* sp.
41 Dipt., Platystomatidae. *Platystoma seminationis*
42 [Scarabeus 8]
43 [Phalaena 16]
44 Hemiptera, Cercopidae ?*Philaenus spumarius*
45 Dipt. indet.
46 Dipt., ?Syrphidae
47 Dipt., ?Syrphidae
48 Dipt., ?Syrphidae
49 [Scarabei aquatici 1]
50 [Phalaena 12]
51 [Phalaena 13]
52 [Phalaena 14]
53 [Scarabeus 9]
54 [Scarabeus 10]
55 Dipt. indet
56 [Phalaena 15]
57 Dipt., Calliphoridae. *Calliphora* sp., probably *C. vicina*
58 Dipt., ?*Lonchaea* sp. (Lonchaeidae)
59 Dipt. indet.
60 Dipt. (there are figures in Hook's *Micrographia* of *Culex*)
61 [Papilio 10]
62 [Scarabeus 5]
63 [Scarabeus 4]
64 [Pseudo-Scarabei 1]
65 [Scarabeus 33]
66 [Scarabeus 6]
67 [Scarabeus 7]
68 [Phalaena 17]
69 [Phalaena 18]
70 [Scarabeus 16]
71 Dipt. indet
72 Dipt., Syrphidae *Platycheirus* sp.
73 Dipt. indet.
74 [Scarabeus 11]
75 [Scarabeus 12]
76 [Papilio 11]
77 [Papilio 12]
78 Ephemeroptera, Baetidae ?*Cloeon dipterum*
79 Lep., Noctuidae *Ceramica pisi* (Broom Moth)

FURTHER READING

Allen (1976) is the best general introduction to the history of natural history in Britain, and if possible this should be supplemented by reading through back issues of the *Journal of the Society for the Bibliography of Natural History* (later *Archives of Natural History*), which contains some very readable articles. Raven (1942) is an excellent work, which describes the life and achievements of John Ray, some of whose friends and correspondents were either probably or certainly acquainted with Charles duBois.

On the entomological side Lisney (1960) contains biographical notes on those entomologists who published during the 17th and 18th centuries, as well as a detailed bibliography of the period. Gardner (1930) deals in detail with the compilation and publication of Mouffet's *Theater of Insects*. Allen (1967) and Bristowe (1976) discuss the entomological activities of duBois' contemporaries, especially Joseph Dandridge. Bodenheimer (1928–29—in German) discusses extensively entomology before Linnaeus.

Several British naturalists contemporary with duBois, mainly known as botanists, are discussed in Pasti (1950), a microfilm of which is lodged in the library of the British Museum (Natural History). The best description of the botanical scene of the period is contained in Henrey (1975). Dandy (1958) contains accounts of those botanists who are known to have contributed to the Sloane Herbarium, many of whom must have been friends of duBois. Most of the references to duBois as a botanist were first traced through Britten and Boulger (1931), which was revised by Desmond (1977).

The social history of 17th-century London is covered excellently in Beier and Finlay (1986), which contains a large number of references to papers on the state of the metropolis in duBois' time. The history of the East India Company is covered by several works, but the most detailed account by far of the duBois family involvement in it is contained in Foster (1924), which also contains a drawing of Charles duBois' grave.

ACKNOWLEDGEMENTS. I would like to thank the following for their assistance in the production of this work: the Entomology Librarians of the British Museum (Natural History) (Miss J. Harvey and Miss P. Gilbert); the librarians of the British Library, Guildhall Library, India Office Library, Linnean Society of London, Public Record Office and Royal Society; Mr D. E. Allen; Mr E. N. Montague; Dr A. W. Armstrong, and my colleagues in the Entomology Department of the British Museum (Natural History). Special thanks are due to the Photographic Unit of the British Museum (Natural History) for their excellent work in photographing the manuscript.

Thanks are due to the British Library and the Royal Society for granting permission to publish transcripts of manuscripts in their collections.

REFERENCES

Unpublished References: abbreviations used

Add. MSS: British Library, London, Additional Manuscripts.
I.O.R.: Records of the East India Company now held in the India Office Library and Records, London.
P.R.O.: Manuscripts in the Public Record Office London.
Sloane MSS: Sloane manuscripts in the British Library, London.

Published References

[Anon] 1812. Notices and Anecdotes of Literati, Collectors, &c. from a MS by the late Mendes de Costa and collected between 1747 and 1788. *The Gentleman's Magazine and Historical Chronicle* **82**: 205–207.

Allen, D. E. 1966. Joseph Dandridge and the first Aurelian Society. *The Entomologist's Record and Journal of Variation* **78**: 89–94.

—— 1976. *The Naturalist in Britain, a Social History*. London (Allen Lane) xii + 292 pp.

Aubrey, J. 1718. *The Natural History and Antiquities of the County of Surrey*. London (Curll) Volume II, viii + 307 pp.

Beier, A. L. & Finlay, R. 1986. *The Making of the Metropolis. London 1500–1700*. London & New York (Longman) x + 283 pp.

Bodenheimer, F. S. 1928–29. *Materialen zur Geschichte der Entomologie bis Linné*. Berlin (Junk) Volume 1, x + 498 pp; volume II, vi + 486 pp.

Bristowe, W. S. 1967. The life & work of a great English naturalist, Joseph Dandridge (1664–1746). *Entomologist's Gazette* **18**: 73–89.

Brierly, W. B. 1949. John Percival. *Proceedings of the Linnean Society of London* **161**: 248–251.

Britten, J. & Boulger, G. S. 1931. *A biographical Index of deceased British & Irish Botanists*. London (Taylor & Francis) 342 pp.

Brown, R. 1810. *Prodromus Florae Novae Hollandiae et Insula Van-Diemen*. London (Johnson) 592 pp.

Collinson, P. 1766. An account of the Introduction of Rice and Tar into our Colonies. *The Gentleman's Magazine and Historical Chronicle* **36**: 278–279.

Dandy, J. E. 1958. *The Sloane Herbarium*. London (British Museum (Natural History)) 246 pp.

Don, G. 1838. *A General System of Gardening and Botany*. London (Rivington & others) Volume **4**, 908 pp.

Desmond, R. 1977. *Dictionary of British and Irish Botanists and Horticulturalists*. London (Taylor & Francis) xxvi + 747 pp.

Druce, G. C. 1928. British plants contained in the Du Bois Herbarium at Oxford, 1690–1723. *Report Botanical Society and Exchange Club of the British Isles* **8**: 463–493.

Foster, J. 1887. *London Marriage Licences 1521–1869*. London (Quaritch) 1595 pp.

Foster, Sir W. 1924. *The East India House: its history and associations*. London (John Lane, The Bodley Head) x + 250 pp.

Gardner, W. 1930. A Lancashire entomologist in the time of Queen Elizabeth. *Annual Report and Proceedings of the Lancashire and Cheshire Entomological Society* **52–54**: 31–52.

Hammond, P. M. 1975. Seventeenth century British Coleoptera from the Collection of Leonard Plukenet (1642–1706). *Entomologist's Gazette* **26** : 261–268.

Henrey, B. 1975. *British Botanical and Horticultural Literature before 1800*. London, New York & Toronto (Oxford University Press) Volume II, xvi + 748 pp.

Hunter, Sir W. W. 1908. In: *The Imperial Gazeteer of India. The Indian Empire. II, Historical*. Oxford (Clarendon Press) xxv + 573 pp.

Jones, M. C. 1863. *Notes Respecting the Family of Waldo*. Edinburgh (Printed for private circulation) iv + 35 pp.

Lankester, E. 1898. *The Correspondence of John Ray*. London (The Ray Society) xvi + 502 pp.

Lisney, A. A. 1960. *A Bibliography of British Lepidoptera 1608–1799*. London (Chiswick Press) 315 pp.

Loudon, J. C. 1838. *Arboretum et Fructicetum Brittanicum*. London (the author) Volume 1, ccxxx + 494 pp.

Mouffet, T. 1658. *The Theater of Insects: or lesser living Creatures*. In: Topsell, E. *The History of Four Footed Beasts and Serpents* ... London (E.C.): 889–1130. (reprinted 1967 by Cass, London).

Nichols, J. 1817. *Illustrations of the Literary History of the Eighteenth Century. Volume I*. London (Nichols, Son & Bentley) 840 pp.

Pasti, J. 1950. *Consul Sherard: Amateur botanist and patron of learning*. PhD thesis (University of Illinois) 253 pp.

Raven, C. E. 1942. *John Ray, Naturalist. His Life and Works*. Cambridge (Cambridge University Press) xix + 502 pp. (reprinted 1986 by Cambridge University Press).

Ray, J. 1660. *Catalogus Plantarum circa Cantabrigiam*. Cambridge (Nealand), & London (Martin, Allestry & Dicas) 182 + 103 pp. (Translated by A. H. Ewan & C. T. Prime, 1975).
——1710. *Historia Insectorum*. London (Churchill) 400 pp.
——1724. *Synopsis Methodica Stirpium*. 3rd edition. London (Innys) 482 + 30 pp.
Stearn, W. T. 1981. *The Natural History Museum at South Kensington*. London (Heinemann) xxiii + 414 pp.
Stearns, R. P. 1952. James Petiver Promoter of Natural Science, c.1663–1718. *Proceedings of the American Antiquarian Society* **62**: 243–365.
Stow, J. 1603. *A Survey of London* (reprinted 1971, Oxford (Clarendon Press) two volumes, xcviii + 352 and 476 pp.)

APPENDIX

Additional to the letters copied below, two manuscripts in the British Library signed by duBois, and photocopies of three pages in the Plant Sciences Library in Oxford have been examined:
Add.MSS 36,139, f.255 is a receipt for twenty nine pounds nine shillings and eight pence, being 6% of £491.8., the value of 126 oz. of gold seized at Portsmouth (Add. MSS 36,139 f.254 is a letter signed by the secretary of the East India Company saying that the company have no objection to the delivery of the gold. The note is dated 28th February 1732, by which date duBois was 76 years old).

Add. MSS 22,852, f.173 is an official letter to Pitt regarding his status as President and Governor of Fort St George. It is signed by duBois as well as several others, presumably officials of the East India Company.

The Oxford manuscript comprises lists, apparently the contents of books of plants, probably from India.

duBois Letters, in date order

1. Sloane MSS 4036, f.316.

> For Dr Hans Sloane
> S^{r} I beg your Pardon for not sending you the acco^{t}. underwritten before, but my want of Health & multiplicity of business of late hinder'd me from many things, y^{t} were my duty; & particularly that of paying this Respect to you: the acco^{t}. I have of a Jew of Amsterdam book keeper to the East India Company of Holland is, that Gold is permitted to be exported from Japan by Authority, but limited by Certain Regulations that are agreed to by y^{e} Dutch & Japonese to a determinate Quantity, as is also the whole Trade between them; I am sensible what I lose by the misfortune of not enjoying your Conversation of late, which I hope to regain in a little Time by more exact waiting on you, & the rest of the good Company, I am
>
> Yo^{r} Obliged humble Serv^{t}.
> May 29th 1697 Charles duBois.

2. Sloane MSS 3321, f.46.
[To Petiver]

> Sr I send you some odd things y^{t} came from India which I found by chance in y^{e} remains of a person gone thither, if they are of no Significancy, commit y^{m}

to y^e^ Flames. I should be glad you would please to give me your Opinion upon the China Fragm^ts^. I sent you in a little brown paper book at your Leisure. Pray does not Mr Ray mention Somewhere a potamogeiton found upon Wandsworth common, if he does or you guess what I aim at, refer me to the place, I am

Yo^r^ humble Ser^t^
Rec'd ye May 8 1700 Charles duBois
No 1

3. Add. MSS 22,851, f.186.

For the Hon^ble^ Tho. Pitt Esq.
President at Fort S^t^ George
India.
Mr Charles Du Boys to recommend Mes^r^ Lyde & Lockyer
ye Colchester Rec^d^ Sept 9^th^ 1702

Sr 98

I am obliged to recommend to you the bearers, M^r^ James Lyde & M^r^ Charles Lockyer, the former is sent to India at the request of the worthy Speaker of the House of Commons M^r^ Robert Harley, the latter at the desire of another member of the House S^r^ Francis Wyndham, these Gentlemen are both my very kind Friends, & the young Gentlemen now sent will I am persuaded deserve your patronage, Your countenance & direction will be a favour which I shall acknowledge on all occasions if you please to let them have it. I am already deep in your Debt for your kindness to my brothers Family in his Absence, but your freedome to me encourages me to go on further. I refer you to the General Letter for publick Affairs, particularly about y^e^ Union of the two Companyes, which will put an End to the disputes between us at home & abroad; the Company have a just Sense of the goodness of your Conduct in those unhappy matters; I am

Sr
Yo^r^. obliged humble Ser^t^
Feb. 18^th^ 1701/2 Charles duBois.

4. Add. MSS 22,851, ff.184–185

For the Hon^ble^ Thomas Pitt Esq. President of Fort S^t^ George
from Mr Cha DuBois for the Colchest^r^ Sep^t^ the 9^th^ 1702
Answerd
S^r^ 97

Your obliging letter of the 19^th^ Sept. 1700 came to my hands for which, & the favours therein mention'd, done to my brother & his Family I return to you my hearty thanks, your kind promises of further Service I acknowledg with due Respect, I have nothing to request of You but on my brothers account, that you would favour him in giving him such advice & countenance as may be of use to him, & to issue if possible in India, the remains of his unhappy accounts. And I hope if it please God he live, He may do so well, as to keep himself clear from any future troubles, & be in a Condition to make some return for your particular friendship. We are at last agreed to unite with the New Company so that you will be Eased of the Troubles you have undergone in the Support of our particular Interest, in which every one of us as far as I find, is very amply satisfyed, & own your acquitting your Self with Honour, Courage & Conduct on our behalf. This union you will have an account of by our Letters. My Share in contributing to it I must in decency omit to mention, only I can truly say that when Some rubbs

were removed, I applyed my small Capacity to effect it with all Sincerity & diligence, & the adventurers who commissioned me one of their 7 Trustees in that affaire, are pleased not to censure my management therein. There are some particulars in the agreement the reasons of which perhaps may not be presently obvious, but when you shall consider that our business was not to diminish the Powers of y^e^ New Company, w^ch^ were to be our own, that many things were enacted by Law which must be submitted to, it being no Season to offer at a new Law, that we were subjected to become Members of the New by y^e^ Act as it stood upon any foot of agreement, & y^e^ Clauses subjecting all our affairs to Entryes with them, & disputes about penaltyes & Forfeitures, I think upon the whole it is well. The mutual Releases we give each other, & the Kings joining therein sets all right; The powers reserved in the King to form us into one joint Interest being the foundation of the whole, which was a thought it pleased God to put into my Mind, & his Ma^tie^. being party in this new agreement gives us a new form of Administration only, upon the Powers & Authorityes of y^e^ 2 Million act, w^ch^ is now equally ours & theirs.

S^r^ I have taken Care of the freeing your Liquors from Freight the Court readily ordering it upon the first motion. What you write about y^e^ dead rich man has too much truth. I belive affairs will never again be so unequally managed, the Gentlemen of both Comp^as^. who will be chosen I doubt not but so ballance things as to render any attempts of that nature impracticable. Your not remembering me I wonder not at, my Conversation & business not leading me into your way, whereby I lost that happiness, but as you are pleased to allow me the Liberty of your acquaintance by Letters I shall be proud of any Opportunity of expressing my just esteem for you for your honourable Management of the Companys business, & for the generous Care of my Relations you have been pleas'd to take, & Shall readily do you any Service in my power, I have but one thing more to trouble you with, D^r^ Buckley is so kind as to furnish me with some Curiosityes in his way, they have been sent sometimes by the under Officers of y^e^ Ship, & thereby have been subject to delay & Searches here, if the Captain were charged with them, their coming to my hands would be more Safe and expeditios. I have thought sometimes that some of your best Indian fruits might be persuaded to grow at S^t^ Helena, by sending their fresh & ripe Stone Seeds or kernells, the Governour has directions to take Care of their planting., it would be an improvement to the Iland. I ask your pardon for this long detention from yo^r^. more weighty Affairs, & am

Yo^r^ Obliged humb Serv^t^
Charles duBois

Since the above was writ, It has pleased God to take to himself our King, to our great Surprize & Consternation, But the Queen now reigning has already by her wise & good Conduct so gain'd the Hearts of her Subjects, as to find no Difference in their Happiness. I have directed the papers of state that have been publick on this occasion to be put into the Companyes Packet.
London 13^th^ March 1701/2
Please to favour me in Sending the Enclosed to my bro. or Sister.

5. Sloane MSS 4039, f.220

[To Sloane]

S^r^ I mentioned to you the other day some Indian specimens Your allowing me to present you with them gives you this Trouble, which upon your admission, shall be follow'd by more, I owe a peculiar acknowledgement for the humanity you always treat me with; this, when accompanyed with my thanks for your favours may be a beginning to be out of debt, & enable me to venture running on Score anew. I dare not say that your doubles of English specimens are what I

want some of, unless I had merited more from you than I find my self capable of, but Men of your Temper act ex mero motu, & free Grace Sometimes, I am

Yo[r] Obliged humb Ser[t]
Charles duBois

Dec[r]. 1. 1703

6. Sloane MSS 4039, f.221.

[To Sloane]
S[r] I am obliged to Dr Buckley at Fort St George & to be even with him intend to send him a few books in his own way, You are so Great a Master, that if you will do me the Favour to send me a List to y[e] value of 4 or 5 li of such medicinal or Chirurgical books as are new & well done, it will keep up in him y[e] Spirit of improving Natural history which has been so far advanced by you, that I'm sure you can't help promoting it all laudible ways, a Line by y[e] pony post will find me if directed to y[e] Lamp in Fenchurch Street, I am

S[r] Yo[r] Obliged humb Ser[t]
Charles duBois.

Dec[r] 2 1703.

7. Sloane MSS 4064, f.47.

[To Petiver]
S[r] Herewith you will receive a book of Insects w[ch] I found last night directed to you. I have sent 2 books of specimens w[ch] to clear to me by putting down on y[e] papers where I may refer to for a name that I may without sparing more time than I can afford, will be an obligation to be acknowledged in any manner you shall direct

Yo[r] humb. Ser[t]
Charles duBois

Decemb. 26. 1704
No 2

8. William Sherard correspondence 575 (Royal Society)

R nov[r] 27[th] 1705 / Answ Jan[a] 18 / DuBois/
To Dr William Sherard / English Consul in Smirna
Dear Sir
I rec'd your Obliging present of Plants by the hands of Mr Petiver, but the Seeds you sent by the Britannia miscarryed; I had the favour of seeing yours to Mr Petiver & rejoyce in the expectation of what is like to be done further by your hand in the Improvement of Botany, Your kind promise of sending me plants & seeds I please my self in, might not some of your bulbs, & tuberous Roots grow here if taken up in proper Seasons? I persuade my Self they would; & then what a glorious accession might we not have to the Furniture of our Gardens, all under your Name, & as oft as seen bringing to mind so considerable a Benefactor to us & the History of Nature; I am very glad to hear of your welfare by all Occasions, the Service I did intend to do your Nephew Fryer, I was disappointed in by the late application his Father made, but I think that disappointment was the Occasion of his being better placed; I shall be very proud in receiving any commands you shall please to honour me with, I am

S[r] Yo[r] Very humble &
obliged Servant
Charles duBois

London

9. Sloane MSS 4064, f.156.

[To Petiver]
S[r] I should be glad to have Dr Plukenets Books sent me if you have done with them, & in case you have any thing to send to India, it is near the time, the ships being dispatching

Yo[r] humble Ser[t]
Jan 3 1707/8 Charles duBois
(No 3)

10. Sloane MSS 3322, f.15

For Mr Petiver at his house in Aldersgate Street
S[r] I take the Liberty you were pleased to give me of sending you some specimens, which if you will be so kind as to name, or to make References to your Museum or any other Author, where I may find them, you will do me a favour, & save me a great deal of time & trouble in guessing at what, you can very readily direct me to at once; If among them there are any that you have not, if you mark them with a P they or their duplicates are at your Service

I am S[r] Yo[r] humble Serv[t]
Feb. 2. 1712/13 Charles duBois

11. Sloane MSS 4065, f.100.

Mr Petiver
S[r] I having a friend going to Paris on a publick acco[t]. whom I can oblige to do me any kindness, I thought the notice might be of service to you, to convey any thing you might want to be transmitted thither, or bring from thence, his stay will be but short, If you will let me know when & where I may see you, I will inform you more particularly, I am

S[r] Yo[r] humble Ser[t]
Feb 12 1712/13 Charles duBois

12. Sloane MSS 4048, f.8.

[To Sloane]
Sr My thanks being paid only verbally for your Noble present, I take this occasion of returning your Paper, & also of repeating my acknowledgement for your curious & instructing Book, & for the humanity you have always Shew'd me, & particularly in your last kind allowing an old Acquaintance to take up some of your valuable time to see the great accessions to your ample collection; I shall with great pleasure attend you, when your more significant affaires will allow you to give me notice when my Attendance on You will be least inconvenient. I am

S[r] Yo[r]. Obliged humb. Serv[t]
June 25. 1725 Charles duBois.

13. Sloane MSS 4053, f.186
[This letter is in very shaky handwriting]

To S[r] Hans Sloane Bar[t] at his house in Bloomsbury.
Hon[d] S[r].

Knowing your Curiosity, I take the Liberty of sending you a Bird brought from Mocka in Arabia faelix by one of our Coffee ships,

The name it goes by in that country is a Lohong. It eats any kind of Fish or Flesh, & seems to be an undescribed Bird, I am with due Respect

S^{r} Yo^{r}. most humb. Serv^{t}
18 March 1733/4 Charles duBois

14. Sloane MSS 4055, f.145

For Sr Hans Sloane Bar^{t}. at his House in Bloomsbury.
Hon^{d}. S^{r}.

The kind Invitation you were pleas'd to send me to dine with you, & my other good Friends, I am extreamly thankfull to you for; I was in the Country that day on acco^{t}. of my Indisposition, & some business I had to do there, which deprived me of the Pleasure of your good Company. My age & Infirmitys I hope will plead my Excuse, & that you will yet allow me to be with great Respect

S^{r}. Yo^{r}. Obliged humble Serv^{t}.
Tower hill
22 July 1737 Charles duBois.

15. Sloane MSS 4055, f.257.

For S^{r} Hans Sloane at his House in Bloomsbury
Good S^{r}

Your kind Invitation to dine with you I thank you for: it would have been most acceptable to me, could my attendance on our East India Court this day have been dispensed with, but, that can not well be. I heartily wish you an happy new year. I am

S^{r}. Obliged humble Serv^{t}.
Decemb^{r}. 30th 1737. Charles duBois.

16. Sloane MSS 4056, f.62

For S^{r} Hans Sloane Bar^{t} at his House in Bloomsbury Square.
S^{r}

My Sister du Bois whom you were so kind as to visit at her Daughters house Mrs Waldo^{s} on great Tower hill, apprehending her Eyes to be worse since her bleeding, desires me to let you know so much, & prays the favour of your ordering what you think proper for her to do further; if you cannot so well Judg without seeing her again, please by a Line to let me know: I am very sorry I was not at home when you last did me the Favour to call at my House. I am

S^{r} Yo^{r}. obliged humble Serv^{t}.
Great Tower Hill
3^{d} March 1738/9. Charles duBois.

17. Sloane MSS 4066, f.336.

[To Petiver]

S^{r} I pray the favour of a line from you by a porter, any time after Tuesday night where I may wait on you, & when, having a necessary occasion for your

advice & assistance, I have taken due care of what you sent, I would attend you sooner, but am obliged to be out of Town 2 or 3 days, am

Yo[r] humb Ser[t]
Jan 23 [no year]. C. duBois

18. Sloane MSS 4066, f.337.

[To Petiver]
S[r], I ask your pardon for keeping your Books so long, I have now returned them with the thanks of

Yo[r] humble Serv[t]
[no date] Charles duB[rest of word cut off]

Mayoral Permit: Sloane MSS 4020, f.107.

London Ss: Permitt and suffer the bearers hereof Charles DuBois Esq. James Pettiver Josep Miller John Cox Richard Fildon James Dandridge and John Verdy together with their Watchmen Servt[s] or Attendants peacably and quietly to pass and travell from hence by water this day being the Lord's Day to Gravesend in the County of Kent it being represented to me that they have extraordinary occasions for their soe doeing therefore you are not in any wise to hinder them therein. Given under my hand and seale the twelfth day of July 1713.

Richard Hoare Mayor

To the Rulers of the Waterman's
Company and all every
Constables and others whom these
may concerne

FASCIMILE AND TRANSCRIPTION OF THE MANUSCRIPT

In the following transcription the spelling and punctuation in text of the notebook has been followed as closely as possible, for instance duBois spells what is now called *Scarabaeus* as *Scarabeus*, and his spelling is followed.

duBois' use of the letter *y* for *thorn* has been retained: readers unfamiliar with that letter should note that it is pronounced as *th*. In the few places where the *long s* has been used in the manuscript, this is rendered by *lower case s*.

There are a few places where the paper has darkened to such an extent that the text is no longer legible, and in other cases a line has been trimmed off in the process of binding. In these instances the missing text is marked by four asterisks in square brackets. The few other editorial comments in the text are also indicated within square brackets.

A page break in the notebook is indicated in the transcription by a short rule ———

Insects
K

ms. notes on Insects, with original drawings written and drawn by a collector in 1692 & 1695.

Purchased from Prof. J. Percival, 'Leighton', Shinfield Green, Reading, Berks.

Genus Papilionaeum

1

Papilio perennis, an 12 Moufet pag. 101.

Taken y^e^ 19 July. It is a nimble fly, & sit with its wings erect, sometimes clapping them down, The lowest figure in Moufet p.101 agrees pretty well with it, but his description is not exact.

The whole body & head is a deep Sad, with long sad brown hairs, especially on y^e^ Thorax, y^e^ horns are long & jointed, y^e^ knob ends in yellow, y^e^ Ground of y^e^ wings on y^e^ upper Side is a full Orange, the upper wing is the Smaller, at y^e^ Setting on it is Sad, 3 large black spots are placed on y^e^ upper Edge on each Side y^e^ middle one, y^e^ ground is buff; & beyond the 3^rd^ near y^e^ End is white + ; The under wing is fill'd about y^e^ middle [****] with long brown hairs,The greater 1/2 is black, then Orange, then a row of bla. Arches, filld with peach in y^e^ middle then black and brown lines undulated, y^e^ edge is serrate, y^e^ under Side is somewhat like y^e^ upper Side but darker colours, & instead of Orange, pale buff colour. + One large black spot is at y^e^ under Edge, & 2 Smaller above it.

This lives through y^e^ winter, it is often found shelter'd in Chambers, & taken in windows shilt, upon y^e^ breaking out of a Clear Sun in y^e^ Spring. The figure is expanded too much, for y^e^ Sake of seeing all y^e^ wings.

2

Papilio alba, alis 6 maculis nigris notatis, extremitatibus etiam nigris.

Taken 17th July in y^e^ Garden, The head is white, y^e^ Eyes round large & black, y^e^ Thorax & Tail black set thick w^th^ white hairs, y^e^ horns w^te^ with black knobs the upper Side of y^e^ wings white the upper wings have 2 black spots each, & the ends black, y^e^ under wings have each one black spot on y^e^ outward Edge on y^e^ Under Sides, y^e^ tips of y^e^ upper wings, & all y^e^ under wings are brimstone colour, y^e^ upper wings have 2 black Spots each on y^e^ under Sides, y^e^ legs are greenish white

[3]

Papilio elegans fusco-fulvus [****]eus alis oculatis [Tak]en y^e^ 1st Sept upon Flos. Africanus [Ye] head and Thorax are Sad, covered with dark brown hairs, y^e^ Eyes Sad also y^e^ horns are finely marked all y^e^ length with Sad and white alternately Set, y^e^ knobs at y^e^ End Black, y^e^ legs are of y^e^ Same colour with y^e^ Thorax, the blackish & w^th^ hair, y^e^ wings are finely marked w^th^ large Orange Spots upon a Sad ground, towar[ds] y^e^ End of each upper wing is a black Spot with a Small white Speck in y^e^ middle of it. y^e^ under wings have only orange towards the Ends, w^th^ 3 black Spots in each, w^th^ w^te^ Specks in them, & a fourth more obscure, these Spots are Circled round w^th^ orange Underneath y^e^ upper wings are almost all Orange, & the underwings finely marbled with different Shades of Sad & cloth colours.

4. Papilio elegans alis nigris, nebulis aurantii colore, maculis albisque notatus.

Taken 16^th^ Sept. upon y^e^ flowers of Tagetes. The whole body & head are very black & hairy, y^e^ Eyes sad brown, the horns Speckt black and white alternately all y^e^ way, y^e^ knobs black tipt at y^e^ Ends wth white. The upper wings on y^e^ upper Side are very black except towards y^e^ Ends, where they incline to purplish, the long bars cross y^m^ are deep Orange, y^e^ other Spots white, y^e^ Edges are Scallopt, y^e^ points are black, between y^m^ white, with a line of purplish above them. the under wings are black w^th^ a broad border of Orange, on each of w^ch^ is set 4 Small black Spots in a Row, tipt & scallopt as before, y^e^ outward Edge is white, all y^e^ wings near y^e^ body are Set with very fine long black hairs, The under Side is very beautifull, The upper wings on this Side are Scarlet where they are Orange on y^e^ other, & w^te^ on this where they are w^te^ on y^e^ other, between y^e^ white & y^e^ Scarlet is a fine blue cloud w^th^ black in y^e^ midst, y^e^ upper edge near y^e^ Setting on is finely markt blue and black like a Jays feather, y^e^ ends of y^e^ wing are brown olive buff & ash colours in clouds &

Spots. The under wings have 2 large buff colourd Spots about the middle of the outward Edge, y^e^ most of y^e^ remainder is clouded of many Sad colours extreamly fine, at y^e^ bottom are 3 Spots like [remainder trimmed off].

[****]ers, y^e^ border is made of lighter colours. y^e^ legs brown.

5

Papilio sulphurea alis angulosis

Taken y^e^ 16 September upon y^e^ flowers of Sultan; The Eyes are Sad brown, y^e^ upper part of y^e^ head, & Along under the wings, is a dirty red, the horns are of y^e^ Same colour, & short, y^e^ Ends thick, not distinctly knobbed, the whole remainder of y^e^ body and wings is brimstone colour, in one deeper, in another taken 22^th^ 7^br^, paler, the thorax & that part of y^e^ Tail next is is very thick set with Small shining hairs standing upwards, y^e^ proboscis is black; In y^e^ midst of every wing stands an Orange Spot, less in y^e^ upper wings; & bigger in the under ones; y^e^ Edges of the wings have also Small Orange Spots set at some distance from each other

---

6. Papilio alis laciniatis

Taken 23^th^ Sept^r^. The head & body are Sad brown, y^e^ horns of y^e^ Same colour except y^e^ tips of y^e^ knobs w^ch^ are white, The proboscis & legs are brown, y^e^ latter pretty long, the wings are cut in & variously indented on the Edges, they Orange, marked with Sad spotts & clouds; Underneath they are finely marbled, with shades of sads and browns, y^e^ upper part Sadder y^e^ lower part lighter, in y^e^ place where y^e^ Sad ends on y^e^ under wings is set on each a very white mark like a c thus C.

7

Papilio alba altera major, alis subtus maculatus extremitatibus nigris

Taken the 23^th^ Sept^r^. It is larger than N^o^.2 about y^e^ head of a dirty whitish green, the Eyes greener, & Show as if they were Spotted with Small black Spots, w^ch^ by a glass appear fairer, & change their Scituation as they are differently objected to y^e^ light, the horns are black Speckt with white y^e^ knobs at y^e^ End tipt with white, y^e^ upper Side of y^e^ body or tail is black & hairy the under Side white, y^e^ legs white the proboscis black, The upper wings white y^e^ Ends black underneath white also tipt with brimstone, with black spots in y^e^ midst of each, The under-wings are with set each with a black spot in y^e^ middle of y^e^ outward Edge, underneath of a dirty brimstone colour, a little of y^e^ Edge near y^e^ body is Orange colour'd.

8

Papilio elegans agilis, Bella donna dicta, y^e^ Painted Lady

Taken 27^th^ of September upon y^e^ flowers of Tagetes, It is very Shy and difficult to come at, The Eyes are black, y^e^ head Set thick with brown hairs, y^e^ horns black tipt with white at y^e^ Ends, The Thorax black, set with brown hairs, y^e^ upper part of y^e^ Tail black mixt with red, y^e^ under part ash colour'd, as are y^e^ Legs w^ch^ are pretty long, y^e^ first pair plumose, Serving to brush y^e^ Eyes & head I suppose. The upper Side of the upper wings is of a Sad ground, y^e^ 3 larger inner marks Orange in one and redder in another Sort perhaps they are of different Sexes, y^e^ 5 Spots at y^e^ End are white, y^e^ under Sides are near y^e^ Same but lighter The upper Sides of y^e^ under wings are Sad with broad borders of Orange Spotted with black. y^e^ under Side is finely marbled wth Several Sad colours interspersed with white Veins & spots & Eyes at y^e^ bottoms.

9

Papilio minor alis aurantii colore, maculatis, & pulchre Splendentibus.

Given me by M^r^ Petiver 23^th^ September who took it y^e^ Same day coming to Mitcham; It is Small, y^e^ horns are broken off, y^e^ Eyes shine like Gold, y^e^ head & body are black, y^e^ Legs ash colour'd, The upper Sides of y^e^ upper wings are Orange & Shine, set w^th^ black Spots, which on y^e^ other Sides are

Eyes, & the Orange Paler, y^e^ border of y^e^ wing is Sad; The inner wings are Sad w^th^ a border of full Orange, Scallopt with Sad, & fringed. y^e^ under Side is paler Sad, Set with several Specks, w^th^ y^e^ Scallopt border.

10

Papilio fusca, alis externis oculo nigro insignitis.
Taken y^e^ beginning of July on the Grass in y^e^ Fields. The Eyes are reddish Sad; The whole head, horns body, & under wings Sad, & somewhat Shining, the upper wings are Sad, shaded & clouded with Orange about the middle of them, towards y^e^ Corners of each Stands a full black Spot, with 2 Small white Specks in it, The under side of both pairs of wings is the most vivid, that of y^e^ upper wings is finely parted in wavy with a lighter colour near the ends.

11

Papilio fusca alis subtus 16 maculis oculatis notatis.
Taken 9^th^ July by The River Side. The Head, horns, body & upper side of y^e^ wings are all Sad colour'd, these last are Set with many long hairs especially near y^e^ head, the Leggs are browner. The under Side of y^e^ wings is marked with Eyes as in y^e^ Figure, Three in each upper wing, & Five in each under wing; In these Spots the first ring is Orange, within that Black, & in the Center a white Speck.

12

Papilio fusca, alis internis oculatis 10 quodammodo accedens. Mouf. n^o^ 4. p.103. fig:
Taken with y^e^ last. This is darker all over than N^o^ 10, The Orange appears not so much on y^e^ back of y^e^ upper wings but more underneath, where it is almost all Orange, y^e^ under part of the under wings is mostly sadder, & y^e^ Ends lighter, w^th^ 3 black Spots in each towards y^e^ bottom. The Eyes are black w^th^ white Edges behind, & before just by the nose, brown; I have one just like this but only with two spots in each under wing.

Genus Phalaenaceum

The Notes of a Phalaena, whereby it seems chiefly to differ from a Papilio, speaking generally, are

1. To fly by night or after Sunset.
2. To sit with its wings dependent, or horizontal, & not erect.
3. To be heavyer & duller, at least to appear so by day.
4. To be more hairy, to defend y^m^ from y^e^ Injury of Night-dews.
5. To have weaker, & Slenderer horns, ending in a point, without a knob at y^e^ End; & to be in some kinds plumose.

1. Phalaena minor alis ex fusco & rubro mixtis, maculis Stramineis.
Taken 23 July in y^e^ morning. The Head & Horns are light Tawny, the Eyes greenish, y^e^ body & tail light-Tawny, & Shining, y^e^ legs also, & Set w^th^ 2 or 3 stiff hairs about y^e^ middle the wings underneath are reddish Straw colour; above they are redder, y^e^ upper wings have each 2 straw colour spot at y^e^ outward Edge y^e^ under, two small lines each of y^e^ Same colour, they are fringed w^th^ a light Tawny.

2

2. Phalaena alba parva graminea. The Grass Moth.
Taken 23 July. They fly in meadows in the Evening in Numbers, keeping near y^e^ ground making short flights, & lighting a Stalk, where they are not easily seen because their wings lye close one on another along their body. The whole body & wings are of a light ash Silvery colour & Shining, y^e^ Eyes are black, from y^e^ Nose 2 long productions come forth, y^e^ horns are Slender & blackish, y^e^ legs are long & Somewhat branched

3. Phalaena alba parva graminea minor
Taken at y^e^ Same time & place. The difference between these is only That this is smaller, & y^e^ underwings deep ash, fringed with white, perhaps this is the male;

---

4. Phalaena minor splendens capite fusco, alis ex purpurea & fusco mixtis
Taken 23 July in y^e^ morning early, flying. The head is almost black, y^e^ Eyes Sad & shining, y^e^ horns of y^e^ coulour of the head, y^e^ body & tail light ash, with a Shew of purple, Shining, y^e^ legs Sad, shining and a little branched. The wings underneath of y^e^ colour of y^e^ Tail, but Sadder towards y^e^ outer Edges; Above, y^e^ upper wings are marbled with Sad & a pale purple, the inner wings light ash, fringed, & Shining. The figure is a little less than the life.

5. Phalaena minor, alis ex fusco & cinerea mixtis
Taken flying at y^e^ Same time. The head is ash colour, y^e^ Eyes black, y^e^ body & tail y^e^ Same, the Eyes of the Rings on y^e^ Tail are whitish, underneath all Shining ash, y^e^ legs small & a little branched, y^e^ upper wings are ash, with 4 marbled darker Spots on each, y^e^ under wings Shining ash, & folded as are those of most Small Phalaenaea

---

6. Phalaena cinerea minor alis maculâ fuscâ obscure notatis.
Taken w^th^ y^e^ last. The Eyes Sad, y^e^ whole upper part is Sad ash & shining, & lighter underneath, marked as (2) w^ch^ is y^e^ underside of y^e^ upperwing. On y^e^ upperwing are 2 small dull Sad Spots, y^e^ ash colourd Legs are long, & Somewhat branched.

7. Phalaena cinerea media dorso nudo.
Taken in y^e^ evening about y^e^ middle of July, It flyes very swift, & plays about y^e^ flowers, The Head & Thorax are thick & bluff, cover'd wth long ash colourd hair, except the midst of y^e^ back w^ch^ is naked Cover'd with an Orange shining Skin. I am in some doubt least I rub'd off y^e^ hair when I took it, but I caught 2 or 3 Since & when I look on them they are all so. The upper wings have 2 white spots like a (Y) & are Shadowed with dark upon ash as in the figure, under y^e^ Thorax is very long hair, y^e^ legs are Sad, a little branchy; This kind is not dorso nudo, M^r^ Petiver calls it y^e^ Gamma, from y^e^ form of y^t^ Letter on its wings.

---

8. Phalaena media alis ex fusco fulvis, dorso nudo.
Taken 23^th^ July in the Evening. It is such another as y^e^ last but not so big, w^th^ a naked back like y^t^, The head body & legs sad, y^e^ Eyes black, y^e^ upper wings marked sad & light brown as in y^e^ figure, the under wings all Sad; underneath it is all Sad, with a Shew of reddishness.

9. Phalaena alba plumata
Taken in y^e^ evening July 23^th^ flying. The Eyes are black The Tail hath a Shew of greenishness, about 1/2 an inch long, & Slender. The Legs are very long, & branched, y^e^ 2^d^ Joynt short, y^e^ last to y^e^ toes very long. Each of y^e^ wings is made of 2 perfect Feathers joyned together near their Origine, y^e^ Antennae + an inch long.

10. Phalaena cinerea alis maculatis, cornubus plumatis.
Taken 26 July in y^e^ night by a Candle. It is all over dirty ash colour wth Sad colour marks on y^e^ upper wings as in y^e^ fig^r^. y^e^ horns are brownish & appear thick, but in a good light are made like an herring bone or thin Set feather as (2) not directly opposite but Setting downwards ? The legs are long & a little branchy.

---

11. Phalaena minor cinerea alis marmoreis.
Taken in y^e^ night by a Candle July 27 It is all ash colour except y^e^ upper wings w^ch^ are marbled w^th^ Sad Strokes as in y^e^ fig^r^. y^e^ Nose is long, y^e^ horns small & Short, y^e^ Legs long, & a littly branchy, y^e^ whole under Side is Sad ash.

12. Phalaena pratensis Mouffeti 3^a^ p. 98.
Taken about y^e^ midst of June flying in a medow by day; The whole body, head, horns & legs are

very black, the wings extend beyond the End of y^e^ Tail, each of y^e^ upper wings is almost black, with long Scarlet Streaks where the black is in y^e^ picture, & 2 Scarlet Spots at the end of each wing, y^e^ inward Spot biggest, y^e^ inward edges are Scarlet also the underwings are wholly cherry colour'd, except y^e^ Edges, which are Sad. y^e^ under & upper Sides of both pair are alike, & they are all finely fringed at y^e^ Ends.

---

13. Phalaena pratensis Mouffeti prima p-g. 97.
Taken 29^th^ June in Coitu on a Stalk of Corn; there is no visible difference between y^e^ Male & Female; It is like y^e^ last, but y^e^ body & Tail is much bigger, The horns also grow thick towards y^e^ Ends, the Sad of y^e^ wings Shines more greenish, & the Scarlet on y^e^ upper wings is disposed into 5 fair Spots, & in some 2 more on y^e^ inner edges, the wings hang down, y^e^ under wings are much less y^n^ y^e^ upper ones, w^ch^ is not observed in Mouffets figure

14 Phalaena albo-fusca alis variegatis
About y^e^ End of June I found an Aurelia hanging upon a Twig, w^ch^ I put into a box, & when I came to look on it, it had produced y^e^ Phalaena above named The whole body & under wings are of a pale cloth colour, the upper wings are variegated, both wings underneath are of y^e^ Same cloth colour with y^e^ body. The Aurelia w^ch^ is drawn too little, was left thus & Seems to confirm y^e^ Notion, y^e^ the head of y^e^ Catterpillar, is that end w^ch^ is y^e^ tail of y^e^ Butterfly.

---

15. Phalaena fusca alis 4 maculis insigni remissi notatus
Taken flying about a Candle in the Garden, in the beginning of July, It is all sad colour'd except the under wings which are ash, the upper wings are marked as in the figure with a Sadder colour, the Eyes are near black & prominent; when it Stands, y^e^ wings lye horizontal, and the under ones are quite cover'd by the upper

16. Phalaena media grisea, alis maculis, cruciformibus notatis, oculis atris
Taken y^e^ last of June on a Ladyes clothes The head is Short & pointed, y^e^ Eyes prominent & very black, from each runs a black stroke to y^e^ Shoulders, y^e^ horns are white at y^e^ Setting on, & after black, small & ending in a point, The back between y^e^ head & wings is very hairy the upper wings are light grey with Cross like marks of sad w^ch^ are Edged with white, the Ends are Scallopt; y^e^ under wings are white, & Shine like Sattin, & scallopt also, & saddish colour'd at y^e^ Ends, y^e^ under Sides of y^e^ upper wings have some sad Spots on y^m^. The Tail is Large & very hairy, blunt at y^e^ End like y^t^ of y^e^ Papilio of a Silk worm, & grey, but whiter along the middle of its underside The Thighs are thick set with white hairs, y^e^ Legs black & white in Small alternate Spots.

17

Phalaena media straminea
Taken in y^e^ night by a Candle amongst Nettles July 8^th^. The whole is straw-colour'd, the Eyes black; The upper wings have faint reddish undulated Lines on y^m^. The under wings are as long & near as large as the upper, y^e^ Leggs are pretty large, strong, & brown; when it was stuck down to a box with a pin, it laid many very small, round, white Eggs, w^ch^ Stuck not to y^e^ box, but rowl'd away as they came out, w^ch^ Eggs in 3 hours time turned black. The Tail is darker colour'd, especially towards y^e^ End. It Sits with its wings hanging down.

18

Phalaena alis ex fusco virescentibus maculis nigris notatis.
Taken with the last; The head is ash colour ending in a long proboscis, y^e^ Eyes sadder, y^e^ horns pretty long & ash color'd. The upper wings are greenish towards y^e^ upper Edges, towards y^e^ ends furrow'd, w^th^ Small black specks at y^e^ ends of y^e^ Furrows, y^e^ middle parts of y^e^ wings are of a shining purplish Sad, on y^e^ upper part of w^ch^ are two black spots a bigger & a lesser in each wing; The under wings are ash colour'd & Shining; The Tail sad ash, the legs are long, ash col^d^. & somewhat branched. While it was stuck down with a pin it laid many small oblong white Eggs, w^ch^

was performed by its thrusting out at y^e^ End of its Tail a long white transparent Tube, w^ch^ it wriggled about & thrust out & drew in often, & now & then one might see the Egg come through it, w^ch^ it stuck to y^e^ box whereon it was fixt.

19

Phalaena tota alba.
Taken in August upon y^e^ Grass on Tunbridg Wells Common It is all over white; The Eyes only w^ch^ are brown, y^e^ Legs very hairy. After it was stuck down with a pin, it excluded much brown woolly matter, wherein it laid its Eggs, w^ch^ were there hatcht in 2 or 3 dayes, I fed them with young lettuce leaves, but they dyed in a week or 10 days, they were of the hairy kind of Catterpillers.

20

Phalaena major elegans tricolor, Goedartij 99.
This sort I hatched, & fed y^e^ Catterpillar w^ch^ they commonly call Shepheards Dogs The Eyes are sad brown, y^e^ head & body, thick set with brown hair, just at y^e^ juncture of y^e^ Neck & Sholders, Scarlet; The horns come out of a Small scarlet knob, they are white set with 2 rows of very fine brown hairs, in manner of a feather. The ground of y^e^ upper wings is pale Isabella marked with large sad intorted Spots, underneath y^e^ Isabella is deeper; The under wings are pale Scarlet spotted with fair black spots, underneath y^e^ ground is pale Orange, The upper side of y^e^ Tail is deep Orange, y^e^ under Side sad except at y^e^ junctures of y^e^ rings w^ch^ are deep Orange; The Legs are Strong, Sad, & a little branched, the upper part of y^e^ Thighs' Scarlet.

---

21 Phalaena Io Paean mihi.
Taken on y^e^ Ground y^e^ beginning of June. It is all hairy, much so about y^e^ head, y^e^ Eyes Sad, y^e^ whole except y^e^ whitish underwing of a dirty sad colour, y^e^ End of y^e^ Tail thick & brushy, The uppersides of y^e^ upper wings are marked w^th^ a Streight black stroke, & 2 round ones less black, & are Saddest towards the Ends where runs across them a lighter undulating Stroke. The Horns are long and finely featherd. I suspect this to be the male of 25, when it was taken it was on y^e^ ground, & could not yet fly, being as I suppose newly gotten out of its Chrysalis, w^ch^ perhaps was buried as was that of 25.

22

Phalaena aliquatenus purpurascens, uniolor Splendens. Margarita. mihi.
Taken y^e^ beginning of June. The Eyes are black, the head not very big, y^e^ horns slender & pretty long, the whole Body Sad. y^e^ upper Sides of the upper, & y^e^ Ends of y^e^ upper Sides of the under wings are of a Shining Sad colour mixt with a faint purplish colour. Towards y^e^ upper part of y^e^ under side of y^e^ upper wings, & towards the upper end of the underwings on y^e^ upper Side is a fine mother of pearl colour.

23

Phalaena cinerea, maculis fuscis variegatis magnis notata.
Taken y^e^ beginning of June, The head is small & sad colour'd, as is also y^e^ Thorax, y^e^ horns small, the Tail ash colourd, y^e^ Wings also, upon y^e^ upper wings on the outward edge Stand 3 large Sad, mixt, Spots, y^e^ upper two, when the wings are near, making an equilateral triangle, the fringe of y^e^ upper wings alternately black & white

24

Phalaena fulva striis tranversis undulatis notata, interdiu sub arborum foliis degens.
Taken y^e^ middle of June, at which time if one Shake y^e^ boughs of bushes one may see y^m^ frequently fly out & make to y^e^ underside of a Leaf of the next bush. The whole is Tawny yellow or buff, The uppersides of y^e^ wings are finely marked with waved Lines of white or Sadder buff running tranversely as far as about 2/3 of y^e^ Length of the wing the rest to y^e^ end is of a lighter buff, & more obscurely undulated

---

25

Phalaena fusca è Chrysalide in terrâ supultâ prorumpens.
About y^e^ beginning of June I found in the new dug Earth several thick sad brown Chrysalis's, w^ch^ put up in a box one of them produced this Phalaena about 14 days after The Eyes are black, y^e^ head Short set on a thick hairy bluff Thorax, Cover'd with reddish Sad hairs, y^e^ Tail thick, & hairy with rings of whitish at y^e^ annulary junctures. The horns long, fine, & brown, y^e^ wings sad, with paler strokes on their Ribbs, y^e^ upper part of y^e^ under wing in some positions shining like peacocks feathers, but it had batter'd it self in the box & was not curiously perfect; It had laid above 100 Round yellowish Eggs in the box, w^ch^ it had finely fix'd by the glutinous matter about y^m^ in the quincunx order, & therefore is a female & by the by, One way of knowing the males from y^e^ Females in this papilionaceous Species is by hatching their Chrysalis's for the Female soon lays her Eggs whether she doth coire or not, tho' in this last case they are Steril.

26

Phalaena alis angulosis, Linea tranversa alas in duas partes dividens. Linea aequinoctialis mihi.
Taken by M^r^ Stonestreet at night by a Candle Set in his window at Carshalton, It is of a brownish Cream colour, y^e^ head & horns small, y^e^ Eyes very black, the Ends of all the wings are pink colour, a reddish brown fair Line crosses all the wings, & below it a Smaller sadder line undulates almost from end to end of y^e^ other line, underneath it is Set w^th^ innumerable small Specks, & y^e^ aforemention'd 2 Lines are Sad appearing on this side also.

27

Phalaena 11 cognata si non eadem alis pulchrè pictis.
Taken about y^e^ End of May in a Lane in East Field. It is a Small Moth, pale ash colour, the under wings Saddest, the ends of y^e^ upper wings are prettily marked.

28

Phalaena pulchra fusca, alis tribus portiunculis undulatis, divisis.
Taken about y^e^ middle of July in y^e^ Woodhouse amongst y^e^ Loggs. The head us yellowish brown, y^e^ Eyes paler, & Shining, the Leggs (w^ch^ are long) & the edges of y^e^ upper wings on y^e^ under Side of a Reddish brown, y^e^ tail on the under Side Sadder, & as it were variegated, & Shining the upper part of the Thorax Tail, Sad, only y^e^ end of the Tail reddish brown, The outer wings are divided into 3 portions next y^e^ head, & y^e^ Ends reddish Sad, that in y^e^ midst between them brown edged w^th^ a waved white Line on each Side, the inner wings sad with white variegations, y^e^ ends of all y^e^ wings have a Small white stroke cross them.

29

Phalaena alba cucullata, alis duobus maculis majoribus ornata
Taken about y^e^ middle of July, The Eyes are small & black, the head, horns Thorax, & beginning of y^e^ [****] Sad mixt so as to make a triangle, a large round Spot of [****] is on each wing on y^e^ outer Edge, The wings otherwise are white, save that towards y^e^ Ends they are more ash colour'd & blackish at y^e^ Tips, y^e^ inner wings underneath have a Small black Speck in y^e^ midst of each, y^e^ Leggs are Speckled.

30

Phalaena ochroleuca cucullata minor
This is y^e^ Sort y^t^ is bred of those animalls that eat y^e^ feathers of the Skins of y^e^ Stuft birds, they fly about them all y^e^ Summer in the Evening

---

Scarabinum Genus

1

1. Scarabeus Terrestris nigro fuscus
Taken 9^th^ September out of y^e^ ground as it was digging, it is all over almost black; somewhat

inclining to Sad brown y^e^ head is flat almost of y^e^ figure of an heart, furnished at y^e^ mouth w^th^ small feelers, y^e^ Eyes small & black, below which Stand y^e^ two horns near 1/2 an inch long, & appear joynted if attentively lookt at, y^e^ Thorax is flat & sharp edged, y^e^ Edges somewhat turned up, y^e^ Vaginae smooth, Shining & furrow'd lengthwayes, the leggs towards y^e^ Ends are brownish, somewhat longer than is common y^e^ hinder ones especially, w^ch^ are Slenderer also.

2

Idem major vaginis non Splendentibus
I remember not where or when taken. This differs not from y^e^ last, except y^e^ the Vaginae are of a Sad dark colour, not so black as y^e^ last, & Shine less, & y^e^ legs are wholly brown; This hath on y^e^ under Side of the Thorax, just before y^e^ Setting y^e^ forelegs 2 small, round, brown, shining prominent knobs, w^ch^ y^e^ other hath not. perhaps this may be the female, w^ch^ in most inseets is y^e^ biggest.

3

3. Scarabeus terrestris, corpore nigro oblongo tumido.
Taken 10 September, digging in y^e^ Garden it came out of the Ground, it runs nimbly the figure is somewhat bigger than the life, It is all over of a dusky black, 4 large Feelers hang at y^e^ mouth, just under y^e^ Forceps, y^e^ 2 uppermost longest, & having each 3 joynts, y^e^ 2 undermost Shorter & jointed also, all ending in knobs, above y^m^ Stands y^e^ forceps or pincers, w^th^ which it bites Strongly, y^e^ Eyes are Small, & black, under them the horns come out near an inch long each, & joynted, the Thorax plate is turned up at y^e^ Edges, + y^e^ Vaginae turn up at y^e^ Edges all round, & towards y^e^ Thorax Shine like Steel, y^e^ tail reaches a little beyond y^e^ Ends of y^m^, y^e^ tail is very thick in y^e^ middle especially rising up to a ridge in y^e^ middle both above & beneath; underneath it is very black & Shining, The legs especially y^e^ hinder ones are large & long.
+ The Vaginae shine remissly, when Seen through a Glass appear rugose.

---

4. Scarabeus melanocyaneus Mouffeti p.160.
Taken about y^e^ End of June. It is all over very black, The figure is Sufficient for y^e^ Rest.

5. Scarabeus ex minimis, ex fusco aurantius.
Found in y^e^ beginning of July a Small oblong dark Orange colour'd slow paced Beetle, alive among old Indian Seed y^t^ came to me formerly by y^e^ Name of Dustoa Vitlu.

6. Scarabeus elasticus major. The bigger Castanet Beetle.
Taken in June. The whole is of a dirty Sad colour The Head Small, y^e^ Eyes Scarce discernible, The Thorax plate pitted in next y^e^ body, The Vaginae a little striate, y^e^ under part of y^e^ Tail smooth and Strongly armed, divided by 5 or 6 Shells of armour, The Legs of a middling Length, When touched it falls from y^e^ place as if dead, when laid on the Back, it will jerk up by a Spring seated in y^e^ Neck to a good heigth, by w^ch^ mean it recovers its feet, when it springs it makes a noise Snapping w^ch^ is y^e^ Reason of its name

---

7. Scarabeus elasticus minor, The lesser Castanet Beetle.
Taken in——. This hath y^e^ Same Springing Faculty as y^e^ former. The head is very Small, with two Small black Eyes; The Thorax plate blackish, the Vaginae chesnut colour'd, w^ch^ reach all round, lower than y^e^ Edges or Sides of y^e^ Tail, y^e^ under part of y^e^ Tail is of y^e^ Same colour, The Thorax plate is continued over Some part of y^e^ Tail.

8. Scarabeus fulvus oblongus Cornubus, & pedibus praelongis.
Taken on a Rose about y^e^ middle of June, The head is longish, The Eyes on each Side Small & black, between w^ch^ a furrow lyes y^e^ length of y^e^ head; Below y^e^ Eyes come out 2 long jointed Horns bending round towards the Ends, Sad Orange towards y^e^ head & growing Sadder upwards, & near y^e^ Ends whitish, The Thorax plate is cloth colour'd, unequall, or depress'd, in Some places; y^e^ Tail part is Squarish at y^e^ Setting on to y^e^ Thorax, & broad, & tapers to y^e^ End where it is blunt, y^e^ Vaginae are pale chesnut, Smooth & Shining, y^e^ under part of y^e^ Tail is cloth colour'd & Shines,

only y^e^ End is Sad Orange, as are y^e^ Legs also, except y^e^ joints of the 4 foremost, & y^e^ thighs of y^e^ hindmost, w^sh^ are The Legs are long, especially y^e^ last joint.

9

Scarabeus Maialis gloriosa Splendens. The Golden Dorr.
Taken flying in Greenwich Town, in the End of May, It is of y^e^ May bug or Dorr Kind; It shines like greenish Gold all over the upper Side, & copper on y^e^ under side of y^e^ Tail part. The Head is Small & Squarish, y^e^ Thorax pretty large, y^e^ plate shaped almost like a Heart, from y^e^ hinder part of which in the middle, a Triangular plate goes down between the Vaginae, The Vaginae are marked as in y^e^ figure, w^th^ whitish or Straw colour, The Tail extends beyond y^e^ Ends of the Vaginae, & hangs down towards y^e^ End, it hath two Spots of y^e^ Same straw colour; The Under part of the Thorax Shines also, & is between green & copper colour, & is thick set with brown short hairs; The skirts of y^e^ Tail is hairy, & so disposed as to imitate those white marks in y^e^ common brown one. The two first Joints of all y^e^ Leggs are hairy, & large, with Several points or prickles on them; the last joynts are Small & weak as in y^e^ brown one aforesaid.

10

Scarabeus minor ovalis, aureus, splendens, tardipes, vaginis punctatis.
Taken in y^e^ beginning of July upon y^e^ Side of the water Tub in y^e^ Garden; It is an oblong Lady bird, The head is small, & hangs downward, Shining green; The Thorax plate shines more gold like, & the Vaginae between green & copper colour; the back rises round & gibbous; The Vaginae by a Small assistance from a Glass appear pitted full of small holes, the horns are pretty long, & by y^e^ Same help pf a Glass appear joynted, The True wings under the Vaginae, are of a fine red, except the Ends w^sh^ are transparent; The whole underside of y^e^ Animal is black; it goes Slowly.

11

Scarabeus parvus chalybis colore & Splendore, alis coeruleo tinctis.
Taken 9^th^ July by the River Side. The whole upper Side shines blue like Steel, y^e^ under part is black, The horns grow thicker towards y^e^ End: the Back rises round it being of y^e^ Lady bird kind, The True wings look bluish, w^th^ Rainbow colours in them, as they are differently objected to y^e^ Light; Each hath a Small black Speck on y^e^ outward Edge

12

Idem corpore oblongo, ex utroque Splendens, cornubus ultiam [?] longioribus
Taken with y^e^ last. Both sides & every part of this Shines like Steel, only somewhat more greenish It is made longer, & the horns longer also.

13

Scarabeus minor oblongus, vaginis nigris, caudâ aculeatâ gibbosus.
Taken y^e^ beginning of June upon the Flowers of Panax Heracleum. When laid on a Table it leaps & jerks about very often. The head is black, which hangs down as it goes along, by reason the back is raised and gibbous, The horns are Small & appear joynted in a glass, the head is slenderly Set on to the Edge of the Neck. The Thorax plate is Orange. The Vaginae are deep Sad or rather black, & to the Eye appear Smooth, but by y^e^ Aid of a Glass one sees them all over beset with innumerable Small points: The whole Tail part is deep Orange, made up of 5 Rings inserted into one another Scalewise; & by y^e^ Glass appears thick Set with down: The Tail ends in a long point like a Sting. The Breast or under part of y^e^ Thorax is covered by a black Shell on each Side, under which y^e^ Tail part comes out, The hinder Legs are Set on y^e^ Edge of this Shell, with Strong Thighs, and are pretty long, by which it leaps so briskly; The Legs are of y^e^ Same colour w^th^ y^e^ Vaginae.

14

Scarabeus medius, fuscus, corpore fulvo.
Taken 28^th^ of May upon Currans, where it is very Common. The head is flattish with small black

Eyes, The Horns 1/2 an inch long, joynted all y^e^ way, & bending downwards towards y^e^ Ends, at y^e^ mouth are Set 4 small short Feelers, the two outer ones longest, which 2 continually tremble; The Thorax Plate is dark is Sad Orange, the Edges of it turn up a little: The Vaginae are dark musk coloured, the True wings under but a little longer than their Cases; The Thighs are orange colour'd, the rest of y^e^ Legs musk, y^e^ latter joints indented; Taken in Coitu June y^e^ 1^st^ the male & female are just alike but y^e^ male is the lesser.

15

Idem omninò fulvus
Taken at y^e^ same time with the last, from w^ch^ perhaps it differs only in Sex, & colour; It is like y^e^ last, only all yellow Tawny, It hath a Small black Stroke on the forehead a little above y^e^ Eyes; At y^e^ mouth stands a Sharp pair of Forceps, wherewith it bites at every thing when it's held; The Horns & y^e^ joints of y^e^ Legs are blackish.

16

Idem fulvus, vaginarum extremitatibus nigris.
Taken y^e^ 8^th^ of July in Coitu on y^e^ Flowers of Levisticum, There is no visible difference between y^e^ Male & Female. There is no difference between this & the last, except that this hath no black in y^e^ forehead; & only the Toes, & y^e^ Ends of y^e^ Vaginae are black in this.

17

Scarabeus minor oblongus, obscure viridis, & remisse Splendens.
Taken y^e^ beginning of June upon y^e^ Flowers of panax Heracleum. The horns appear joynted to y^e^ naked Eye, the 2 feelers at y^e^ Mouth have knobs at y^e^ Ends, & by y^e^ help of a Glass, one Sees y^m^ composed of 3 joynts; the whole is of a dull green, a little Shining, The toes seem to be white like those of many Flyes.

18

Scarabeus minor rotundus, griseus, maculôs nigrôs [?maculas nigras] duobus insignioribus notatus.
Taken 15 June & 25^th^ May on Verbascum in Coitu; The male & female are perfectly alike, It is about y^e^ bigness of a common Lady bird, The Head is long & Slender with 2 Small antennae, The whole is grey with exceeding little Spots, One fair round black spot is placed on y^e^ back, & another near the Tail. These vary in their grey colour, Some almost black, & some fine speckt black & white, y^e^ females are after some time exceeding turgid at the Tail part.

19

Scarabeus minor rotundus ruber, vaginis 2 maculis insignitis
Taken 8^th^ July. It is a small Lady bird; The Thorax plate is black, w^th^ a Small white Spot on Each Side, & an oblong one next y^e^ Neck, & two very Small ones next y^e^ mouth, y^e^ Vaginae red each marked with one black Spot, y^e^ true wings brownish, y^e^ under side is all black. The Thorax Plate & head appear as at (2) in y^e^ Glass.

20

Scarabeus Maialis minor
Taken 28^th^ of May. It is just like y^e^ great brown Dorrs or May buggs, save that it wants the white marks on y^e^ Sides of its Tail, & is not 1/4^th^ so big, The Horns are only trifid at y^e^ Ends, y^e^ head & Thorax plate shine like Steel, in the male more purplish, & in the Female more blue, The Vaginae are brown, as in y^e^ great Sort. The male is the less & rounder body'ed, y^e^ female bigger & flatter. This sort appear about y^e^ End of May, when the greater Sort go out, & eat y^e^ young Leaves of Trees as they do.

21. Scarabeus minor oblongus fuscus lineis flavis notatus
Taken 28 May. It is about 3/4 of an inch long, the head large & dusky, w^th^ a bright yellow ring between y^e^ fore part of y^e^ neck & y^e^ Eyes, y^e^ horns are about 1/4 of an inch long, Orange near y^e^

head, & growing darker to y^e^ ends, the Vaginae dusky, elegantly marked with yellow lines cross y^m^, the Legs dusky orange, the hinder ones very long, w^th^ Strong Thighs as if designed for leaping.

---

22. Scarabeus aeruginosus **D. Petiver**.
Given me in September by M^r^ James Petiver, who took them in Coitu, the male is y^e^ lesser. The whole except y^e^ under part of the Tail, & y^e^ Legs, is of a dirty shining vertdigrease colour; The Head is long & issues out from under the Thorax plate Tortoise wise, on each Side of y^e^ middle whereof is set a small Eye, & at y^e^ End two horns, divided into 3 joynts each; The Vaginae are continued down y^e^ Sides pretty deep, & to y^e^ end of y^e^ Tail, w^ch^ ends in a point; y^e^ under part of y^e^ Tail & y^e^ Legs are black, The Thigh joynt in y^e^ Legs in eminently swelled in y^e^ middle.

23. Scarabeus domesticus impennis
Given me by M^r^ Petiver, who saith That they are common in many Cellars in London; It is black all over, The Vaginae adhere to y^e^ body, & have no parting, they are continued down the Sides & leave about half the Tail open, w^ch^ is composed of 5 annulary portions.

---

24. Scarabeus minor viridis splendens
Taken out of new dug Earth Apr. 20. The head is black, & y^e^ Eyes, w^ch^ are very small The Thorax plate & Vaginae shining green, the Vaginae striate, y^e^ horns & leggs brown, y^e^ whole under part Sad dark colour'd.

25. Scarabeus minor obscurè griseus ventre albente.
Taken on y^e^ ground Apr. 20, The head & horns very small y^e^ Eyes black, y^e^ whole upper part is very Sad grey, as it were faintly chequer'd, y^e^ under part whitish ash with an Eye of peach in it, growing redder when dead, y^e^ Legs black

26. Scarabeus minor unicolor, capite erectiore
Taken in a Spiders web May 3. It is all of one cloth colour, y^e^ Eyes small & black, y^e^ horns a little thick at y^e^ Ends, y^e^ Legs pretty long, it walks slow but with its head more raised than common

---

27. Scarabeus minor vaginis seminibus Ricini modo aliquatenùs notatis.
Taken with y^e^ last, The head & Thorax is Shining black, y^e^ Vaginae shining Sad towards chesnut colour wth darker broad marks on y^m^, y^e^ Legs horns & Eyes are very small y^e^ whole under part sad.

28. Scarabeus minor splendens capite ranino.
Taken upon y^e^ Ground May 4. where it runs nimbly by starts, y^e^ whole on both sides is shining copper colour'd, y^e^ horns small y^e^ head Square with prominent Eyes, y^e^ whole looking like a Frogs head

---

29. Scarabeus arantii coloris, subtùs niger, cornubus cervinis.
Taken 9^th^ May on a Goosberry bush; The whole upper side is deep Orange, The whole under side, Legs & horns are black y^e^ horns have one row of small points their whole length.

30. Scarabeus niger vaginis striatis
Taken on y^e^ Ground 6 May. It is somw^t^. like N^o^ 1. but bigger of a Shining black all over.

---

31. Scarabeus viridis maculis fusco-luteis.
Given me by Mr Petiver. The head is bold & full, y^e^ black Eyes prominent, y^e^ mouth fueille=mort y^e^ feelers & forceps green, Lines of Sad part y^e^ neck & Thorax plate, & that & y^e^ Tail part, the Sheath wings are Spotted with filemot & y^e^ Ends tipt with y^e^ Same The whole under part & y^e^ Legs are changeable green blue & copper colour, y^e^ lower part of y^e^ Tail blue. The Eyes in a glass appear pitted as a Flyes.

32. Scarabeus arboreus minor dilute Viridis splendens
Taken 16 May from an Apple Tree. The Eyes are small & black, y^e^ neck long, y^e^ horns & Legs brown y^e^ whole (otherwise) light shining green, y^e^ thigh eminently thick in y^e^ middle, in one of this kind y^e^ thighs are green & Shining in another not.

---

33. Scarabeus minor rotundus ruber, vaginis 12 maculis nigris insignitis.
Taken 16 May. It is a smaller Lady bird than N^o^ 19. The head & Thorax plate is white set with large black spots y^e^ Vaginae red with 12 black spots thereon, the under side black.

34. Scarabeus minor, gracilis, longus, fuscus cornubus longis geniculatis
Taken on y^e^ flowers of Panax Heracleum May 26 in Coitu. Tis all of one Sad colour, long & Slender, y^e^ horns long & jointed, y^e^ legs long y^e^ thigh thick in the middle, reddish towards the body, the Vaginae Smooth & Shining, y^e^ true wings sad at y^e^ Ends, y^e^ under part of y^e^ tail Shining, greyish & divided into 6 rings. y^e^ female biggest, y^e^ male in mounts on her back.

35. Scarabeus minor remisse splendens, Scapulâ lata.
Taken on y^e^ ground May 19^th^ It shines all over of a faint copper above underneath black, as are y^e^ Legs, y^e^ Eyes very small & y^e^ horns also, the Thorax plate is large, & Square at y^e^ Setting on to y^e^ Sholders. The Vaginae appear Striate by a glass

36. Idem nigrior.
Taken on y^e^ ground about y^e^ Same time, There is little difference except y^e^ horns are thicker, y^e^ Legs browner, & y^e^ Vaginae more visibly Striate. I suppose this may be the male to y^e^ last.

---

37. Scarabeus minor ferè rotundus, viridis & pulchre Splendens **acetosivora**.
Taken 26 May upon Sorrel, where many are to be met in Coitu about this time, & some of the females so big bellyed that they can Scarce go. All the upper part is of a beautifull Shining green, y^e^ horns w^ch^ are thickest at y^e^ Ends, & under y^e^ Tail black, y^e^ Legs Steel & shining. The Vaginae in a glass appear curiously pitted.

38.

---

39. Scarabeus vaginis subviridibus, apicis coccineis.
Taken 26 May upon y^e^ flowers of Panax Heracleum. It is much of y^e^ Shape & Size with n^o^ 17. y^e^ upper part greenish, & somewhat Shining, y^e^ Ends of y^e^ Vaginae are tipt with Scarlet the Tail is greenish divided by whitish rings. The Sides are Scarlet just under y^e^ Setting on of the wings. The true wings at y^e^ Ends have fair Sad spots on them.

40. Scarabeus niger Londinensis Scapula lata.
Taken on y^e^ Ground in y^e^ Street in London about y^e^ middle of May It is all over black, The head is small in proportion, y^e^ horns thick at y^e^ End, y^e^ Thorax plate is broad & hangs over y^e^ Sides, & every way else The Vaginae are turned up at y^e^ brims, & hang over y^e^ Tail, & have 3 raised Striae lengthwise in each of them

41. Scarabeus minor vaginis Testudinis . . . transparens & variegatus.
Taken in y^e^ Gravel pits, The head & Thorax plate Shine like Steel, y^e^ Vaginae very like Tortoise shell, y^e^ Tail black & Shining, y^e^ Legs brown, y^e^ horns pretty long.

Scarabei aquatici.

1. Scarabeus minor aquatilis, fuscus compressus.
Taken in y^e^ water in a pond about the middle of June The whole is of a Sad colour, y^e^ head not distinguishable from y^e^ Thorax part, having two very slender horns, w^ch^ by the help of a Glass appear jointed, & by y^e^ Same aid two small black Eyes are seen on each side of y^e^ head; The Vaginae Shine, & are (especially near their Setting on) bent inwards with a fold to go under part of y^e^ Tail part, This contrivance seems designed to preserve the wings from being wetted when they

swim The under part is Sadder than the upper. The 4 forelegs are brown & armed with 2 Claws each at y^e^ Toes to creep with, & issue out of y^e^ Forepart of the Thorax together: The hinder Legs issue out of the hinder part of the Tail pretty low, & end in flat Fins to Swim with, which They do very nimbly, diving down as soon as one aproaches them They will frequently lye at y^e^ Top of y^e^ Water basking themselves in y^e^ Sun.

Pseudo-Scarabei.

1

Blatta Mouffeti. p. 138
Taken about our house in London by night, where there are multitudes of them of various Sizes, so that it appears they grow after exclusion, vide Swammerdam

---

Gryllotalpa

Muscae quadripennes

1

Musca quadripennis, capite hippocampoide, cauda Scorpii. an Musca Scorpiura Mouffeti p. 62 fig.ult.
Taken 19 July on the Rasps. The head is small & chesnut colour'd, on each Side of w^ch^ is a large chesnut colour'd Eye, in y^e^ forehead are 2 Small yellow spots, out of w^ch^ come 2 horns about 3/4 of an inch long, & appear joynted, by a glass; y^e^ mouth is a long brown beak, furnished at the bottom with Small feelers; in the neck is a ring of yellow with a Small yellow line behind it one Scarce discerns the Thorax from y^e^ Tail, but from y^e^ head it Seems continued all y^e^ way in sad rings with yellow Edges & a yellow line on each Side, at y^e^ end of y^e^ Tailes are 3 joints like a Scorpions Tail; smooth, Shining & brown, y^e^ last of w^ch^ is thick & ends in a Strong forceps, this part of y^e^ tail turns up, & when one touches y^e^ Insect it endeavours to pinch one therewith; The legs are yellow long, & Slenders, sadder towards y^e^ Ends, w^th^ 2 Stiff hairs Standing at each middle joynt, they are Set upon Strong thighs fixt to y^e^ Thorax, the wings are large, prettily Spotted with black. Taken also 10^th^ May on y^e^ ground it could not yet fly
[figure on next page]

2

Chrysopis
Taken 22 July among thick bushes, It is all green, except y^e^ nose w^ch^ is yellowish, & they Eyes standing out on each Side the head like Studs of Gold, y^e^ horns are 3/4 of an inch long whitish, & very Slender, the 4 wings are much of a Size longer than y^e^ body, & turned to the light Shine finely wth Crimson; I could smell it stank.

3. Chrysopis altere major foetida.
Taken 22^th^ July flying in y^e^ Evening, In all points like the former, but as bigg again, & one I took 4 times as big, these larger ones stank very rank of humane Excrements.

---

1. Musca apiformis, caudâ fulvâ nigro notatâ, Taken 15 July upon poppy flowers in my brothers Garden at Hackney; The way of flying & looks of it would make one Suspect it a Bee, but that it hath but two wings, & a head of y^e^ make of a Fly, w^th^out long horns, indifferently large, the large Sad chesnut Eyes meet, the nose is furnisht wth y^e^ 2 Small black horns common to flyes, & is large, downy, & ash colour'd. The Thorax & Taile are cover'd all over & under with fine brown hairs, y^e^ back of y^e^ Thorax is blackish & a little Shining, y^e^ Taile is marked as in y^e^ figure, black where y^t^ is black, & orange where that is white, y^e^ under part of y^e^ Taile 2. is y^e^ 2 first rings black, y^n^ a white small line between y^t^ & the next ring w^ch^ is bla. y^n^ y^e^ rest up to y^e^ body is white w^th^ a black Spot in y^e^ middle, y^e^ legs are black, except 1/2 y^e^ middle joynts, y^e^ wings are Somewhat brownish.

2. Musca apiformis caudâ fulva nigro notatâ altera, pulchrè annulatâ.
Taken 16 May & wth y^{e} last from w^{ch} it differs only in these particulars, y^{e} Tail in y^{e} Cross mark, varys a little in y^{e} form, & the 3 last annulary portions of y^{e} Tail are finely edged with white Under y^{e} Tail, this is orange where y^{e} former is white, & y^{e} wings have a little Spot on y^{e} outward Edge.

3. Musca apiformis 3a caudâ totâ annulis albis distincta. This differs from y^{e} first but y^{t} y^{e} Tail hath no Orange, but is marked only with 3 white rings both above & underneath; Taken with y^{e} last.

4. Musca minor cauda eleganter annulata. Taken y^{e} middle of July upon y^{e} leaves of Caryophyllata. The eyes meet, sad Chesnut y^{e} little horns black, y^{e} mouth Silvery, y^{e} back of y^{e} Thorax sad & striped, y^{e} tail finely divided into black & w^{te} rings crost by a line from end to end, y^{e} tail is thin & macilent, Sad underneath, y^{e} wings Sad, especially at y^{e} Setting on, & outward Edges, y^{e} legs black, y^{e} Soles of y^{e} feet white y^{e} Thorax & tail are hairy.

---

5. Musca molendinarià minor; y^{e} Smaller Millers Fly. Taken on y^{e} Rasps, middle of July. The Eyes are Chesnut, & almost meet, & have a Silver Edge round y^{e} backside, y^{e} horns are black, y^{e} nose Silver y^{e} back Sad, & somewhat Shining, The Tail composed of 3 or 4 Rings, y^{e} End black, & about y^{e} middle shining wth white changeable Spots as it is differently turned to the light, the whole Tail is Set wth pretty Stiff black hairs, The wings pretty large, & longer than the Tail, brown at y^{e} Setting on, the membranes under y^{e} wing, by w^{ch} perhaps they make their Noise is white & large, the under Side of the whole body is black, the Legs are pretty long, a little hairy & black, y^{e} Toes white.

6. Musca molendinaria major vivipara.
The greater Millers Fly. The Eyes are red or brick colour, & meet not, y^{e} horns are black & pretty large, between y^{e} Eyes, & the nose is Silver, the Thorax is grey, black & w^{te} in Stripes, y^{e} Tail appears checquerd of bla. & w^{te} if differently objected to y^{e} light, underneath less vividly, y^{e} legs are somew^{t} hairy, long, & black, y^{e} Toes w^{te}. This will sometimes when taken let fall small white worms out of y^{e} anus. y^{e} wings are large, & have a tincture of blewishness upon them.

7. Musca fusca media alis pulchra Splendentibus.
Taken 22 July upon Currans, y^{e} head is pretty large, y^{e} Sad Eyes meet, over y^{e} Small black horns is a shining Spot, y^{e} mouth Shines also, y^{e} Thorax is Sad & Shines remissly, y^{e} tail is Sad, underneath blaek & Shining y^{e} legs are black, the wings lye over one another a little, & Shine vividly, y^{e} inner parts green, & outward Copper.

8. Musca fusca cauda subtus canaliculata. Taken 22 July upon y^{e} Doronicum Americ. *Park.* a black broad line parts y^{e} chesnut Eyes, under y^{e} Small black horns is y^{e} Silver'd mouth the Thorax is obscurely Stript next the head, y^{e} tail is sad made of 4

Rings, underneath black, wth a furrow running lengthwayes narrow at y^{e} tip, & broader towards y^{e} body, y^{e} legs are all blaek wth white Toes, y^{e} wings Saddish transparent, & longer than y^{e} Tail.

9. Musca apiformis fusco = fulva, major.
Take in y^{e} beginning of September upon y^{e} Flowers of Tagetes It much resembles a bee in its looks, colour way of flying & feeding on Flowers, but wants the 4 wings & horns w^{ch} I take to be Characteristick notes of a Bee. It is a large fly, of a dark sad, set with fine brown hairs, y^{e} eyes are dark sad pearced (in a glass) as in y^{e} Common Fly, divided on y^{e} top of y^{e} head by a black shining knob, Two small black horns come out of another black knob, each Set wth one fine hair y^{e} face is thick set wth Small brown hairs, extends downward in a hard longish beak wherein lyes y^{e} proboscis, The Thorax is very hairy on all Sides, y^{e} Tail less so, blackish & shining & when y^{e} fly alights it heaves up & down as if it helpt its respiration; it is somewhat compresst y^{e} Sides being edged, upon pressing y^{e} End I could not discern any Sting. The Legs are Sad, on y^{e} Edges hairy, y^{e} middle joints of y^{e} 4 first legs whitish, y^{e} hinder legs large strong, & having y^{e} middle portion large & flat as in y^{e} hony bee The 2 wings are long & large very transparent, having on each outward

edge a Sad Spot or Stroke, y^e^ Ribs in y^e^ wing disposed unusually, y^e^ wings lye a little over one another, & not as in y^e^ figure.

---

10. Musca Splendens caudâ compressâ, alis ex fulvo fuscis.
Taken about y^e^ middle of June upon y^e^ flowers of Podagraria. The head is wholly taken up by the Eyes, which meet together, & Shine greenish, & appear pearled in a glass; Two small horns come out before, under which is a Small black Shining spot. The Thorax shines and is a vivid green, & by y^e^ help of a glass appears full of brown hairs; The Tail shines also & is of a brown green appearing to be full of brown down in the glass. it Spreads broad towards y^e^ End, & comes off round, & is made up of 5 Rings; underneath it is flattish, & y^e^ Edges round turn downwards, & y^e^ Glass shews it to be finely punctate; The Legs are Sad brown, The wings are longer than y^e^ Tail, & brownish all over.

11. Musca longa gracilis, 3 Striis nigris in dorso notata, aliis fusco-fulvis.
Taken 19^th^ May on y^e^ Flowers of panax Heracleum where many of y^m^ sit together thrusting down their long proboscis into y^e^ hollow of y^e^ Flowers. The head is round & Small y^e^ Eyes not easily discernable, being of y^e^ Same sad colour with y^e^ rest of y^e^ head, 2 small stiff horns come from one Original in y^e^ fore part of it. y^e^ body is ash on y^e^ back are 3 fair black Stripes, y^e^ tail & Legs sad & hairy, y^e^ wings long & brown, y^e^ 2 parts under y^e^ wings common to all flyes are Small knobs set on a slender thred

---

12. Musca media fusca, caudâ 4 maculis nigris notatâ.
Taken 19^th^ May upon y^e^ Flowers of Panax Heracleum; Its Eyes meet & are sad, y^e^ nose Silverish, w^th^ 2 small hairy horns thereat, y^e^ body is dark grey, y^e^ Tail Lighter w^th^ 4 fair black Spots thereon, very hairy & underneath parted lengthwise with a broad black line, y^e^ membranes under y^e^ wings are whitish.

13. Taken 25^th^ May on Apricock Leaves. The Head & back is Sad, y^e^ Eyes large almost meeting. The upper Side of y^e^ Sharp pointed Tail black & shining, divided into 4 rings by white Circles, y^e^ belly yellow, at y^e^ End black, The 4 Leggs before Yellowish, y^e^ hinder ones sad, with a brown Spot in the midst of y^e^ 2 upper joints. The division between the 2 Eyes white.

14. Musca apiformis velox luteo et nigro varius. Cauda Scorpii.
Taken 1^st^ June in y^e^ Lane near East Field. It is a very beautifull Fly, The head is large, y^e^ Sad Shining Eyes meet atop, between them in the fore part of y^e^ face are 2 large long yellow Spots parted by a black line y^e^ 2 horns black, thick & indifferently long, y^e^ Thorax is black two small yellow lines run down y^e^ Length of it in the midst, & on each side are 4 irregular yellow Spots, 2 about y^e^ Setting on of y^e^ wing & two below it. between y^t^ thorax & y^e^ Tail is set a Small oblong black body circled round with yellow, y^e^ Tail hath 5 Rings y^e^ 3 first have yellow rings upon black but they meet not in y^e^ midst, y^e^ lowest most yellow, a broad list of yellow on y^e^ Sides divides y^e^ upper & under parts of y^e^ Tail, under it is black & yellow in alternate rings, at y^e^ End of y^e^ Tail is a yellow Scorpion like Tail w^ch^ it clapt up to y^e^ under part of y^e^ Tail, armed w^th^ brown Claws, visible in a glass.

---

15. Musca pavonina gracilis splendens.
Taken y^e^ beginning of June & 17 July on Rasps, & Curran bushes. It shines green all over, the Eyes especially, between which is a white Spot, & just above that, come out 2 Short horns standing out two ways, The wings are long & large towards y^e^ End sad, & white at y^e^ very end; The Legs are brown; towards y^e^ Ends Sad, & pretty long.

16. Musca media tota viridis splendens.
Taken y^e^ first of June on y^e^ Hedges in y^e^ Lane near East Field, where were many of them, It is all over green, except a Small white Stroke divides y^e^ Eyes, y^e^ horns are black & end in a fine hair, the Thighs are brown y^e^ rest of y^e^ Legs black.

17. Musca fusca Nasicornis.
Taken w^th^ y^e^ last, The Eyes are reddish brown, parted on the top with a pretty black division, a Streight brown shining horn goes streight out at y^e^ Nose under w^ch^ hangs a Streight black thickish tongue, y^e^ true horns are brown, The Thorax is Sad, with 3 black stripes thereon, y^e^ appendent knob to y^e^ thorax between y^e^ Setting on of y^e^ wings, sad chesnut colour the Tail is chesnut, the Edges of the Rings black, & divided lengthwise by a black Stroke, y^e^ Tail is almost circular, flat, & sharp at y^e^ Edges, underneath brown in y^e^ middle, & blackish at y^e^ Edges the Legs are Sad. The wings are brownish

---

Genus vespinum. The Wasp kind.
I reduce those Insects of my own observation to this kind, that have 4 wings, & whose Tailes or hinder part of the body is joyned to y^e^ breast or chest by a Small thread, as Mouffet speaks page 42. Corpus vesparum medio pectori tenuissimo quodam filo alligatur; whether they have Stings or not;

1.
Vespa minor duobus aculeis, annulis in caudâ flavis, maculâ insigni flavâ in fronte notatâ. Vespa Brachmanica nobis. The Bramine Wasp.
Taken y^e^ beginning of June, The Head is large & black, as also are y^e^ Eyes, w^ch^ are black, the Horns come out of y^e^ forehead, arising from two Originals, & seen in a Glass appear joynted, & grow bigger & bigger from y^e^ head to y^e^ Ends, the Mouth is furnished with a Serrate Forceps, one part of w^ch^ in Shutting goes over the other, & opens Sideways, & bites very hard; just above the mouth & between y^e^ lower part of the Eyes, is a fair yellow Spot rising above the Surface like a Studd. The Thorax or body is black; & that & the Tail are cover'd with a hard Shell, the Tail is composed of 7 or 8 Rings of yellow upon black, w^ch^ go one under another when it Shrinks in its Tail, as the plates do in Armour; The Tail is Set to the body by a very Slender juncture, as in this kind is common, The legs are yellow & indifferently long. It hath 4 Wings, long & Slender, the inner ones not above 1/2 the length of the outer ones. With much irritating at length it thrust out 2 Stings set at some little distance from each other, several times. I call it by this Name from y^e^ Bramine Custome of making a yellow Spot in the foreheads of their Votaryes.

1.
Vespa Brachmanica.

2
Vespa Brachmannica altera, ore aura micante The Golden mouth'd Bramine wasp.
Taken 19 July on y^e^ Currans, The Eyes are larger than the former & black, between them are 2 Small lines of yellow, where y^e^ horns come out, y^e^ bottom parts of y^m^ stands up against y^e^ Face & are yellow, & y^e^ upper parts bend off forward & are black, y^e^ mouth Shines like Gold, under w^ch^ plate is a small forceps; In y^e^ hinder part of the head, stand 3 Small Shining knobs triangular-wise, Scarce visible without a little Assistance from a Glass. The Thorax is all black on both Sides except 4 yellow spots next y^e^ head; The Tail is slenderly Set on made of 6 yellow rings set upon black, w^ch^ appear but obscurely underneath, The Thighs are black, y^e^ rest of the Legs yellow, except y^e^ Toes, w^ch^ are black, the 4 wings are Sad transparent, & have a Shew of rainbow colours on them

---

3.
Vespa minor tota nigra. The small black wasp.
Taken 19 July, It is all black, except a Small Silver plate at y^e^ mouth; & y^e^ wings, w^ch^ have a Saddish tincture on y^m^, the inner ones are much less y^n^ y^e^ outer ones.

4. Vespa longa, pectore & dorso nigris, caudâ & dorso macula alba notatis, cornubus tremulis in medio albis.
Taken in y^e^ beginning of June on y^e^ flowers of Tithymalus Tingitanus lunato fl. *Moris*. The head,

Eyes, & Thorax are black, except one w^te^ Spot between y^e^ Setting on of y^e^ wings, on y^e^ back. The Horns are more y^n^ 1/2 an inch long, curled at y^e^ Ends, & black except a portion of w^te^ in y^e^ middle, trembling incessantly when it goes; The Tail hangs on by a Slender thread, the first ring black, y^e^ 2 next Orange, y^e^ remainder black, w^th^ a white spot at y^e^ End; when first taken, by thrusting the Tail towards the Head, came out a black point or Sting from y^e^ middle of y^e^ under part of y^e^ Tail; The under part of the body is colour'd like y^e^ upper, but y^e^ Tail is flatter, with a ridge in y^e^ midst of y^e^ rings running lengthways; The Legs are long, y^e^ first joynts black, then lighter orange, then black, then brown to y^e^ Toes. Vide N^o^ 7

5

Vespa longa pectore & dorso nigris, minor absque aculis albis.
Taken on y^e^ Same flowers & at the same time with the last. The head Horns & Thorax are black the Tail long, & Slenderer than y^e^ last, made of 7 rings of w^ch^ y^e^ first is black, the 3 middle ones Orange, & y^e^ 3 at y^e^ end black, the leggs are browner than the former, it hath not the Spot on y^e^ back & Tail, & the Horns curle not so. The figure is a little bigger than y^e^ life & the Tail too thick.

6. Vespa nigra minor gracilis, caudâ in 2 Setis aculeum inservientibus desinente, cornubus praelongis tremulis
Taken w^th^ y^e^ last; It is all black, save y^e^ orange thighs; when it goes y^e^ horns tremble exceeding fast, feeling what is in y^e^ way; The outward edge of y^e^ bigger wings hath a Small Spot on it, a long Sting or point comes out under the tail about y^e^ midst, w^ch^ when y^e^ Tail lyes streight remains between y^e^ 2 Setae in w^ch^ the Tail ends, w^ch^ Seem a guard to it, & when y^e^ Insect pushes w^th^ it, in bends y^e^ Tail downward & towards y^e^ head, & thrusts the said sting strongly towards y^e^ head, as that N^o^ 4 also doth.

7

Vespa oblonga maxima pecore & dorso nigris, cauda 4 & dorso tribus albis maculis notatis,cornubus tremulis, in medio albo notatis
Taken 14 September. It is very like N^o^ 4 but 3 or 4 times as bigg, & besides y^e^ Spot which that hath in y^e^ middle of y^e^ back, this hath one at y^e^ Setting on of each of y^e^ bigger wings; y^e^ white Spot at y^e^ end of y^e^ Tail is here distinguish into 4, one on each of y^e^ 4 last rings, in y^e^ other y^e^ Tail is flatter, in this very turgid, opening on each Side, which apperture or Slitt is supplyed by a thin yellow Skin, in all other things this is like y^t^.

8

Vespa caudâ corpori firmius adhaerente.

---

9. Vespa nigricans graculis N^o^ 6 similis ast major, caudâ absq Setis.
Taken 25^th^ May on y^e^ Flowers of Panax Heracleum, It is every way like N^o^ 6 but bigger, & hath not the Sting, or Setae w^ch^ that hath; perhaps it is y^e^ female to that.

10. Eadem fronte flava
Taken in y^e^ Lane by East Field. June 1^st^. This differs in nothing from y^e^ last but in y^e^ Square yellow Spot it hath between y^e^ Eyes, & y^e^ finely jointed horns are yellowish before, & black behind.

Apinum Genus

Bombylius Dni Purchas. Viviparus.
He describes it p. 188, & gives an Anatomical account of it, & also of its being viviparous p. 191. Purchas's Theater of political flying Insects. Anno 1657. In y^e^ figure y^e^ first white ring is yellow in y^e^ Bee y^e^ w^te^ ring in y^e^ midst of the Tail is yellow also, & the end white. The figure is a little too big. I took one of this sort May 10^th^ three times as big.

2. Apis fusca caudâ glabrâ
Taken upon Poppy flowers 17^th^ July. It is all of a dark Sad colour, y^e^ face & back, thick set with fine

Brownish hairs, the horns short & streight, y^e^ Tail Smooth & Shining, under w^ch^ was much yellow matter like bee bread, y^e^ wings brownish, w^th^ a deeper brown Stroke on y^e^ outward Edge of each of y^e^ bigger wings near the End, y^e^ Legs middling; Just at y^e^ Setting on y^e^ wings, on each Side is a remarkable small round black shining knob.

---

3. Apis minor fulva, alis praelongis, Iridis modo splendentibus
I have forgot when & where taken, & it is described dead. The head, horns, & middle of y^e^ back is black, The Tail on both Sides Orange, & y^e^ Legs also except y^e^ last Joints w^ch^ are speckt with black All 4 wings are very large & much longer than the Tail, y^e^ outward Edge of y^e^ upper marked with a black Stroke, They shine finely with Rainbow colours.

4. Apis gloriosa
Taken on Cherry Leaves, May 24 The whole forepart & Legs is of a beautifull bluish green; & y^e^ Tail especially y^e^ upper part shining copper, on the Sides changeable into yellow, gold & green, all foraminulous. when urged it puts forth a long flexible Sting. The wings are sad

---

Genus Cimicinum.

1.
Cimex subviridis variegatus, odorem gravem spirans.
Taken in the beginning of June; It moves slowly, when it stands still the head is raised like y^t^ of a Frog, & if laid on its back, it can hardly recover its feet, which after much Struggling it does by turning over its head. It smells very Strong, & very ill; & when dead turns all black, & shrinks up to meer Skin. The head is like a Tortoises; y^e^ two Small Eyes are black; y^e^ horns have three Joints, white at y^e^ Junctures, elsewhere blackish; The Thorax & Tail greenish; it hath neither Wings nor Vaginae. Round y^e^ Skirt of y^e^ Tail part on both Sides it is marked with little V's. The middle is regularly mark'd wth Spots the 4 largest & middlemost are copper colour'd & in bas-relieve, y^e^ others black & not raised. the belly is green with a black line running cross its length. The legs are greenish also, but blackish at y^e^ Ends.

Taken at Tunbridge Wells 1695

1. Bombylius niger, cauda in acumen aurantii coloris desinente
Taken among y^e^ Corn upon y^e^ flowers of Panax Coloni Aug.3. The figure is too long; it is all over black except the 3 last Rings of y^e^ Tail, w^ch^ are Orange, being thick set with hairs of y^t^ colour, deeper above, & more remiss underneath; A shining black Small knob on each Side of y^e^ Thorax at y^e^ Setting on of y^e^ wings, y^e^ legs are Strong & hairy

---

2. Phalaena Splendens ex aureo-fulva
Taken flying in y^e^ day 5 August, It is all of one light-brown colour Shining as if varnisht with a dilute gold colour; The Eyes are round, prominent & very black, y^e^ horns short & Slender; It hath a particular way of flying, y^e^ wings moving fluttering, & by turns quicker & slower.

3. Papilio alba, alis maculatis corpore nigro. Taken 12^th^ Aug. flying, y^e^ middle of y^e^ Thorax black, as is y^e^ upper part of y^e^ Tail, y^e^ Eyes very black & prominent, round y^e^ Thorax &, about y^e^ head, is set w^th^ w^te^ hair, y^e^ under part of y^e^ Tail & y^e^ legs cover'd with a mealy whiteness, y^e^ horns black tipt at y^e^ ends with white, y^e^ wings on y^e^ upper sides white with black as in y^e^ figure, y^e^ ribs of y^e^ wings blackish, y^e^ under wings on y^e^ under Side brimstone y^e^ ribs large & blackish, y^e^ under Side of y^e^ upper wings w^te^ except y^e^ Ends, w^ch^ are also brimstone colour'd.

---

4. Papilio minor alis ex fulvo fuscis, macula nigra in media alba insignitis.
Taken 12 Aug. on y^e^ Common, y^e^ upper wings are pale orange for y^e^ most part, except round y^e^ Edges & in y^e^ middle where they are Sad, y^e^ under wings are only orange in y^e^ middle, &

underneath all Sad, Sadder towards y^e^ Setting on, & y^e^ lower 1/2 lighter, y^e^ upper wings have each towards y^e^ End, a fair black spot with a Small white Spot in y^e^ midst of it, y^e^ whole body head & horns very Sad, y^e^ horns have not a knob set on y^e^ End, but near y^e^ End grow thicker only.

---

5. Scarabeus major terrestris ater splendens vaginis Striatis.
Taken on y^e^ Common 13^th^ August creeping in y^e^ paths There are 2 Sorts, a less w^ch^ I take to be y^e^ female, y^e^ under part of w^ch^ is purple Shining as Steel, y^e^ bigger Shining green, w^ch^ I suppose to be y^e^ male, y^e^ first pair of Legs is set on y^e^ Thorax, y^e^ Second on y^t^ part of y^e^ tail next y^e^ Thorax, & y^e^ 3^d^ pair in y^e^ midst of y^e^ Tail, w^th^ Strong thighs.

Notes upon Insects &c. 1692 & 1695

Their Genus

See under 4 1. Musca corpore & alis fuscis, caudâ in longum acumen desinente, capite parvo, bicorni, proboscidi recto, pedibus longis pilosis. this is a dull heavy fly taken 28 May, on y^e^ Currans.

2. Eruca parva viridis striatus Geometer. this is that w^ch^ eats up y^e^ Filbeard leaves, it hath 3 pair of feet before, & only one pair behind, besides those holders at y^e^ tail, by which it will Stand erect & reach out its whole body to lay hold on what is in its reach, y^e^ head is almost transparent; fine small whitish Striae run along y^e^ length of y^e^ back; taken off y^e^ Filberds 28 May.

3. Eruca viridis major se contorquens &c. taken off y^e^ grass in the common, its head is green, hath 3 pair of feet before, 4 pair in y^e^ middle, & y^e^ 2 holders at y^e^ Taile, on each Side just above y^e^ insertion of y^e^ feet runs a pale pretty broad yellow stripe the whole length of y^e^ body, along y^e^ upper part of this yellow stripe runs a fine line of white & on y^e^ top of y^e^ white a broader line of Cinamon colour, with white Spots in it, w^ch^ Spots stand one in y^e^ midst of each ring; On each side of y^e^ back runs one other Small pale yellow stripe y^e^ length of its body, in the middle of y^e^ back at y^e^ insertion of one ring into another is a Small spot of Cinamon colour, about 6 or 7 in all, those rings towards y^e^ head & taile having none; when it creeps the body seems to move within y^e^ Skins before y^e^ Skin, y^e^ rings are inserted almost Scalewise, when 'tis disturbed it roals it self round, falls on one Side, & puts y^e^ Taile over y^e^ head by way of security, I fed it with Aprecock leaves.

3. Eruca major fusca caudâ protuberante, found under y^e^ Coping of a brick wall, it seemed near its change, (lost)

vide 66 & 67 4. Scarabeus medius fuscus Saltans. when taken it counterfeits its Self dead, & when turned on its back it will leap up, by a Spring in the neck; Mr Doody calls it y^e^ Castanet Fly, from y^e^ Snap it makes, w^n^ it Springs.

1 Adde to N^o^ 1. y^e^ Taile is bifurcate if narrowly viewed, it hath 3 black Stripes on the back, y^e^ outward Edges of y^e^ wings near y^r^ insertion are brown, y^e^ legs & back are furnished with small fine hairs, y^e^ back is gibbous, y^e^ head hangs lower y^n^ it, y^e^ Eyes are larger & rather more chesnut cold than y^e^ rest of y^e^ head.

---

5. Musca flava corpore producto, capite, & dorso nigro, bicorni. taken 5 or 6 June, y^e^ colour is a vivid orange yellow, y^e^ 4 wings are of y^e^ Same colour only towards y^e^ Ends more transparent & y^e^ outward Edges of them black almost to y^e^ End, y^e^ 2 under wings are not black at all, y^e^ leggs are yellow too, only y^e^ lower parts spotted black, y^e^ 2 horns arise not out of y^e^ Same origine as in some others, 2 small yellow threds hang from y^e^ mouth y^e^ horns stand as in Goats, y^e^ very point of y^e^ Taile is black, It is but a dull fly, or Bee rather

6. Scarabeus minor rotundus griseus maculâ nigrâ in dorso & altero in Caudâ notatus, proboscidi producto antennis pra[****] I took it June 15 on Verbascum, it is grey with exceeding little Spots, on y^e^ back a fair round black Spot appears, & another near y^e^ Tail, it is about y^e^ bigness of a common Lady Cow they were in Coitu, the Male & Female are perfectly alike.

7. Eruca elegantissima, flavis & nigris maculis notata, iracundus The ground of their body is a pale blewish white, the body is composed of 12 or 13 rings, on y^e^ top of the back, & in y^e^ middle of each ring is a large yellow spot, upon w^ch^ yellow Spot are 4 small black spots set in a Square, on each side of y^e^ body along its length are smaller yellow spots one on each ring, upon & about w^ch^ are many bla spots of several figures & bignesses, y^e^ head is bleak yellow spotted wth very small black spotts, it hath 3 pair of Feet before, 4 pair in y^e^ middle & y^e^ 2 holders at y^e^ Tail, it feeds upon y^e^ Leaves of Verbascum, I found many of them about y^e^ End of June but not on any other plant, when touched it Springs & jerks like a fish newly out of y^e^ water, & throws it body round Securing its head with its tail, it is a little hairy, y^e^ hairs are long but thin set

8. Eruca striata quasi oculata, about 1 1/2 inch when at biggest Somewhat hairy, y^e^ head is blewish with 2 black spots seated in y^e^ place of Eyes, a white line runs y^e^ length of it just in y^e^ midst of y^e^ back, on each Side are slender Stripes of orange blew & Sad, y^e^ blew y^e^ broadest, y^e^ rings of y^e^ body are longer & flatter, it hath 3 legs before 4 in y^e^ midst & 2 holders, I fed it with

---

Aprecock leaves, & after 20 dayes in y^e^ middle of June it Spun a long fine white Silk web. See after

9. Musca sanguisuga, y^e^ Horse fly, y^e^ Eyes are very like an Opal in y^e^ fine changeableness of its colours, y^e^ head very wide, extending on each side beyond y^e^ Sholders, y^e^ wings grey, y^e^ proboscis blunt & flat at y^e^ end as a leeches mouth

10. Musca minima viridis, saltans alis praelongis, this is y^e^ production, y^t^ appears upon y^e^ backsides of leaves & stalks in Clusters like Lice, it hath 2 very small black Eyes, 2 long horns & 4 wings, y^e^ outermost are as long again as y^e^ body, y^e^ 2 innermost much less, it flyes hovering in the Evening, & when it lights if touched skips as a Grasshopper a great Length, probably it is necessary it Should be thus furnished to throw it self into y^e^ Air when it is about to fly, y^e^ length of y^e^ wings hindering its more immediate flight from y^e^ place where it stands.

11. Phalaena media ex albo & nigro varia, alis ultrinque eodem more notatis, y^e^ head & Shoulders are yellow w^th^ bla Spots, y^e^ Eyes black, y^e^ rings of y^e^ tail end in a yellow Circle going round it, y^e^ legs are branch[ed] & ash colour'd Shining, y^e^ antennae more than 1/2 an inch long Sordid, y^e^ wings are finely marked with black or near it, y^e^ ground w^te^, all four wings are nearly alike.

12. Phalaena tota alba plumata, y^e^ body is slender, about 1/2 an inch long, y^e^ legs very long & branched, y^e^ wings each are composed of 2 perfect feathers joyned together near their Origine, y^e^ eyes very Small & black, y^e^ antennae about 1/8 of an inch long.

13. Phalaena fulva

---

14. Vespa minor duobus aculeis, annulis flavis in cauda, insigni maculâ flavâ in fronte notata. Taken y^e^ beginning of June, The body is black & y^e^ tail also but divided in rings w^ch^ go one under another when it Shrinks in y^e^ tail (y^e^ whole body being cover'd not w^th^ a thin Skin but a hard Shell) as in y^e^ joints of armour y^e^ rings are bright yellow, y^e^ body is set to y^e^ tail by a very small juncture as in wasps & hornets, y^e^ head is large as are the Ey's which are black, y^e^ horns come out of y^e^ forehead & Set before y^e^ Eyes, arising from 2 originals, seen in a glass are jointed, but smooth, & grow bigger to y^e^ End, just above y^e^ mouth & between y^e^ lower part of the Eyes is a fair yellow Spot, like a Stud, y^e^ mouth is like a Lobsters Claws opening Sideways & one going over the other, so y^t^ it Seems to be an Insect of prey in armour. y^e^ legs are yellow and indifferently long, with much irritating at length it thrust out 2 Stings at a distance from each other, several times, & bites hard with its serrate Jaws. y^e^ figure is not slender enough, & the wings to long. Its 4 wings are long & Slender, y^e^ under one but 1/2 the length of y^e^ upper ones.

15. Cimex sylvestris subviridis variegatus odorem gravem Spirans, taken y^e^ beginning of June, it smells very ill & very Strong, round y^e^ Skirt of y^e^ back marked with little u's on both its sides, y^e^ 4 middle most of y^e^ Spots on y^e^ back appear like copper bullae y^e^ belly is green a line of blackish running through y^e^ midst of it from y^e^ tail, it has neither wings nor Vaginae, when it Stands Still y^e^ head is raised like a frog, & when turned on y^e^ back, it can hardly raise its self up, & then it turns

over its head, y^e^ legs are of y^e^ colour of y^e^ body, but more blackish towards y^e^ end, y^e^ head like a Tortoise, w^th^ 2 Small black Eys, y^e^ horns are joynted w^th^ 3 joynts, white at y^e^ junctures elsewhere blackish, it moves not fast.

---

16. Musca pavonina gracilis Splendens, it Shines green all over the Eyes especially between which is a white spot, & just above that comes out two horns Short & standing two wayes, the legs are brown, towards y^e^ Ends Sad, & pretty long; taken beginning of June & 17 July on currans on y^e^ Rasps. y^e^ wings are long & lar[ger?] towards y^e^ End Sad, & y^e^ very End.

17. Scarabeus minor oblongus niger cauda aculeata, gibbosus. Taken y^e^ beginning of June, when laid on a Table it leaps & jerks very often, the Vaginae are deep Sad or blackish, & to the Eye appear Smooth, but by the Glass have innumerable small puncta all over them, y^e^ whole Tail is deep Orange, made up of 5 rings inserted one under another Scale wise, & in y^e^ glass thick Set with down, y^e^ Tail ends in a long point like a Sting y^e^ part between y^e^ head & wings is y^e^ Same Orange colour y^e^ head black like y^e^ Vaginae, w^ch^ it goes hanging down perpendicularly, by the reason y^e^ back rises high, & gibbous y^e^ horns are Small & appear joynted in y^e^ glass, the head is Set on to y^e^ Edge of y^e^ Neck slenderly, a black shell covers y^e^ breast on each Side from under w^ch^ y^e^ Tail comes out y^e^ hinder legs are Set on y^e^ Edge of this Shell, with Strong thighs, & are pretty long, by which it leaps. the legs are of y^e^ Same Sad colour with y^e^ Vaginae. taken upon Panax Heracleum.

18. Apis longa Subtus flavescens. Taken at y^e^ Same time & place with y^e^ last y^e^ black Eyes are large taking up almost all y^e^ head, & in y^e^ Glass appear as a flyes pitted. y^e^ 2 bla indifferently long horns appear jointed 1/2 way also, y^e^ wings are 4 the 2 biggest lye over y^e^ lesser, w^ch^ biggest reach beyond y^e^ tail y^e^ upper part of y^e^ tail is black except where one ring of yellow crosses it, y^e^ legs are long, y^e^ upper part of w^ch^ are bla. y^e^ foremost least, y^e^ middle ones more, y^e^ hindermost most the whole under part of y^e^ Insect is of a pale Yellow. between y^e^ Eyes hangs down a yellow part in w^ch^ is y^e^ forceps, & behind it a Strange apparatus of parts for y^e^ Service of y^e^ mouth.

---

18. A rude draught of y^e^ apparatus of y^e^ forementiond Bees mouth
1 y^e^ forceps
2 wipers
3 a kind of trifid tongue under w^ch^ Seems to lye the Gula.

---

19. Scarabeus minor oblongus obscurè viridis, & remissè splendens. Taken at y^e^ Same time & place with y^e^ last It is of y^e^ duller green shiners, y^e^ 2 feelers have knobs at y^e^ Ends, & in y^e^ glass appear to have 3 joints y^e^, the horns are jointed to y^e^ naked Eye, the whole body & vaginae are of one colour, y^e^ toes end as flyes, & appear a little white.

20. Vespa pectore & dorso nigro, cauda & dorso macula alba notatis, cornubus etiam in medio albis. The head Eyes & body is black, save y^t^ in y^e^ midst of y^e^ back between the Setting on y^e^ wings is a white Spot, y^e^ horns are more than 1/2 an inch in length curled at y^e^ ends, all black except in y^e^ midst of each horn is a portion of w^te^, y^e^ Tail is set on by a Slender black thred, & is black to y^e^ first ring, y^e^ Second & third ring are Orange colour, & y^e^ remainder to the End is black save a white Spot at y^e^ End, the legs are long y^e^ first joints black, then comes a lighter orange, y^n^ bla. y^n^ brown to y^e^ toes, when it goes y^e^ horns move incessantly. taken y^e^ beginning of June on y^e^ Tithymalus Tingit. lunato flore *Mons.* when first taken it thrust its tail towards y^e^ head & from y^e^ under part of y^e^ Tail about y^e^ middle not y^e^ End came out a long black point or Sting, but it Seemed black, y^e^ under part of the body is in coulour like y^e^ upper, but y^e^ tail is flatter under neath, with a Ridge running in the midst of y^e^ rings length wayes

---

21 Scarabeus minor oblongus fuscus lineis flavis notatus. Taken 28^th^ May, its length is about 3/4 of an inch, y^e^ head large, dusky, w^th^ a bright yellow ring round between y^e^ fore part of y^e^ neck & y^e^ Eyes, y^e^ 2 hornes about 3/4 of an inch long, orange near y^e^ head, & growing darker to y^e^ End, y^e^

Vaginae dusky prettily marked with yellow thus. the legs dusky orange, y^e^ hinder ones very long, w^th^ Stronger thighs as if designed for leaping, tho, I did not see it leap.

22. Scarabeus medius fuscus corpore fulvo. taken 28 May it's very common about Curran's y^e^ head is flattish w^th^ Small black eyes, y^e^ horns are 1/2 an inch long joynted all y^e^ way, & bending downward towards y^e^ Ends, at [y^e^] mouth are set four small Short feelers y^e^ 2 outer ones longest w^ch^ 2 continually tremble, between y^e^ head & the setting on of y^e^ wing is a dark orange colour'd plate y^e^ edges of w^ch^ turn up a little, y^e^ Vaginae dark musk colourd, y^e^ wings under but a little longer than their cases, y^e^ thighs orange, the rest of the legs musk, the latter joynts to y^e^ toes jointed & indented on each side y^e^ body

23. Idem fulvus. taken y^e^ Same time y^e^ Same with y^e^ former only all yellow tawny, except y^e^ horns & the joints of y^e^ Legs. it hath a Small black stroke on y^e^ forehead a little above y^e^ Eyes, w^n^ touched [****] from y^e^ place where it stood. it hath a Sharp pair of forceps w^th^ which it bites at everything w^n^ taken.
Scarabeus Maialis minor. taken at y^e^ Same time, It is just like y^e^ may beetles save y^t^ it wants [****] Sides, y^e^ male is the less & rounder bodyed, the female bigger & flatter [****] between y^e^ head & wings is in y^e^ male more purple, & in the female [****] at y^e^ End of May when y^e^ greater sort go out, & eat young [****] are only trifid

---

[****] taken y^e^ Same time eating Curran Leaves, y^e^ head black circled [****] but one next y^e^ tail yellowish, y^e^ rest of the body greenish, & almost [****] small black spots are set on each ring & a larger black spot in y^e^ midst [****] it hath a few very short small hairs on y^e^ body, it moves not as the [****] a worm, it hath 3 pairs of Legs before, 6 pair beyond y^n^ & the 2 holders at y^e^ tail [****] it throws its body over its head standing on it 6 forefeet like y^e^ Tumblers [****] 1 & 1/2 inch in Length, the fault in this picture is 1 pair of Legs too much, & too many rings. the last pair of Legs being set on y^e^ next ring but one to y^e^ tail
this is y^e^ better draught, only y^e^ legs are too long.

26. An Scarabeus ex minimis totus viridis imperfectus, taken y^e^ Same time about 1/6 of an inch, with very Small dark colour'd Eyes, long horns, & pretty long legs, imperfect wing stick upon y^e^ back about 1/2 way its length, tis nimble, qu^a^ if of kin to y^e^ Cuckow spit
this is somew^t^ bigger y^n^ the Life

27. Eadem alba. just y^e^ Same only w^te^ w^th^ a faint shew of greenish upon it, phaps not so ripe

28. Scarabeus ex minimis chalybis colore & Splendore, hypocritica, vel ex motu se mortuum fingens taken 26 May, it retires into y^e^ hollow recesses of Flowers, Dandelion, Hyacinth. Angl. &c y^e^ Vagina are like Steel in colour & shining, the wings w^n^ extended near as long again as y^e^ Vaginae, transparent, & as they are differently objected to y^e^ light have a faint Shew of rain bow colours, two small antennae w^th^ knobbs at y^e^ Ends, w^n^ toucht it falls out of y^e^ flower & counterfeits its Self dead.

29. Vermiculus mihi punctum Saliens dictus. 26 May extending a Sheet of white paper near y^e^ hot beds, one may see Small black animals light on it, about the bignesses of these points which run indifferently fast, if disturbed they Skip out of sight, viewed by a glass they appear worms annular rings forming y^r^ length, & at y^e^ head 2 horns feelers, they move with 6 legs in y^e^ middle of y^e^ body or 8 they were too Small & nimble for observation

---

28. Musca maxima quadripennis fulva. Labella taken 28 May on y^e^ Rasps, this is y^e^ 4th in Mouffet p. 66. in his description y^e^ wings are Said to be argentei coloris, but they are w^n^ held on one Side aurei coloris otherwise transparent.

29. Labella ex minimus, an 4a Mouffeti, taken y^e^ Same time. If it be Mouffets his description & figure are not exact, It is blew y^e^ head large & Eys prominent a broad bar of black cross y^e^ top of y^e^ head from Eye to Eye, 3 bars of bla. run lengthways from y^e^ head to y^e^ Setting on of y^e^ wings the middlemost y^e^ broadest, y^e^ tail is divided into 6 or 7 joynts markt black as in y^e^ figure, on y^e^ upper

side of the legs a bla slender stripe runs lengthwise, y^e^ fibers of y^e^ wing cross each other at right angles.

30. Centipes Iulus. about y^e^ root of Tulips between y^e^ Coats of y^e^ rotten ones are many of [****] Sizes, I am of opinion y^t^ they are hatcht there of y^e^ Eggs deposited by y^e^ [****] y^e^ least are whitest. they have 2 joynted antennae, their feet end in Sharp points

31. Scarabeus ex minimis, fuscus progressum analis imitans [****]

---

it light on my book as I was reading in y^e^ Garden,

32. Scarabeus ex minimis capite Chalybeata ex fulvo fuscus pedibus fulvis agilis taken 27^th^ May digging it came out of y^e^ ground, y^e^ head & sholders shine like Steel, it hath 2 long horns jointed with long joints scarce to be Seen well but by a glass & 4 feelers about y^e^ mouth, y^e^ legs indifferently long, & pale [****] body almost black, y^e^ vaginae towards y^e^ Sholders fulvous towards y^e^ tail blackish Shining Steely, y^e^ Vaginae appear Striate in a glass it runs very nimbly,

32. figure as it appears by a Glass

33. a Small fly in y^e^ Gnat Shape but without featherd antennae, y^e^ head almost all taken up by y^e^ Eyes, w^ch^ are like a Common flyes, a Slender Neck, y^e^ back gibbose, & Elegantly marked with 4 black Spotts, of w^ch^ this is y^e^ better figure, y^e^ body dark colour'd y^e^ legs greenish, & long this figure is 6 times bigger than y^e^ life, this is to be referr'd to y^e^ brown long legs in y^e^ meadows, & not to y^e^ Gnats, they are to be found on y^e^ Cieling of y^e^ Necessary house. Musca Culiciformis dorso quatuor maculis notato.

---

34. Vespa pectore & dorso nigro, minor, sine maculis. Taken on y^e^ Same Tithymale at the same time, the difference between these is, this wants y^e^ Spot of white on y^e^ back. & taile, & y^e^ white on y^e^ horns, which are longer & not curled at y^e^ Ends, y^e^ legs are browner, perhaps this is y^e^ Male, w^ch^ is the lesser in many insects.

35. Vespa minor gracilis nigra cauda in duobus seris, aculeum inservientib. desinente, cornubus praelongis tremulis. Taken at y^e^ Same time on y^e^ Same Tithymale; It is all black, except y^e^ thighs w^ch^ are Orange, when it goes y^e^ horns by w^ch^ it feels are moved trembling exceeding fast, there is a Small Spot on y^e^ Edge of each of the bigger wings, a long kind of Sting comes out from near y^e^ middle of y^e^ tail underneath, w^ch^ when the tail lyes Streight remains between y^e^ 2 Setae in w^ch^ the tail Ends, w^ch^ Seem made for a Guard to it, & when y^e^ Insect pushes with it, it bends its tail inwards, & y^n^ thrusts it very Strongly, as one may feel with a pin. See N^o^ 20.

36. Musca Vespoides nigra, capite magno, ore albo, cornuorum etiam extremitatibus albis. Taken y^e^ beginning of June on the Rasp bushes. y^e^ head wth y^e^ Eyes is large, y^e^ 4 wings dusky, y^e^ whole black, except y^e^ mouth, ends of y^e^ horns, which are white & two white Spots on each side under y^e^ wings at y^e^ juncture of y^e^ taile & chest, this moves as y^e^ last with its horns tho' not so quick, & would be nearer of kin but y^t^ y^e^ body is set on to y^e^ tail more Strongly, & not by so Slender a thread.

---

37. Musca Splendens cauda compressa, alis ex fulvo fuscis. Taken in y^e^ midst of June upon y^e^ flowers of Podograria. The head is wholly taken up by the Eyes w^ch^ meet together, & shine greenish, & appear finely pitted in a glass, 2 Small horns come out before under w^ch^ is a Small black shining Spot, y^e^ body is vivid green Shining & in a glass appears full of brown hairs, y^e^ tail is a brown green Shining, appearing to be full of brown down in y^e^ glass, it Spreads broad toward y^e^ End, & comes off round & hath 5 rings, underneath tis flattish, & y^e^ edges round turn down & in a glass looks finely punctated, y^e^ legs are Sad brown, y^e^ wings are longer y^n^ y^e^ tail, & brownish all over

38. Musca fulva caudâ villosâ, alis in medio parva macula insignitis. Taken at y^e^ Same time & place. The Eyes Stand prominent on each Side y^r^ head of a Sad colour, w^th^ 2 paler edgings on y^e^

inside, or before y^e face, in y^e middle of w^ch between y^e Eyes is a reddish Spot, y^e body is indifferently large, & somewhat gibbous, of a Sad grey mixt colour inclining to brown, the Tail is very thick Set w^th fine brown long hairs, as are the legs, & all y^e under part of y^e body. The wings are pretty large, & longer than the body, with a Small Sad or brown Speck in y^e midst of each.

39. Musca oblonga, cauda et alis nigrofulvis ore argenteo. Taken at y^e Same time & place. They Eyes take up the whole head, in y^e midst of y^m come out 2 blunt orange colour'd horns arising from a black original, y^e mouth & parts under the horns are white & Shine like Silver, the body is a dark Shining copper colour, down y^e length of y^e tail runs a broad black line, y^e End of y^e tail above & underneath is Sad & shining, & at y^e End underneath stuck a flat substance like wax, y^e rest of y^e under part of y^e tail to y^e body is yellowish white, the legs are all black, pretty long & thick, y^e inside of y^e toes white y^e wings lye over on another as it Stands, & are of

---

a blackish brown, shaded darker about y^e middle

40. Musca chalybeata, corpore caeruleo cauda viridi, Splendentibus, capite fusco. vide 45
Taken at y^e Same time & place with y^e last the head is taken up wholly with y^e Eyes w^ch are Sad y^e nose or mouth whitish y^e 2 little horns black, y^e body shines lively like Steel, & y^e Tail is shining green, & somewhat downy, y^e legs are black, & not long.

41. Musca fusca, alis griseis, compressa lata, caudâ latâ obtusâ. Taken at y^e Same time & place. The head is dark, y^e Eyes also about y^m on the back sides is a line of white y^e body is Sad, y^e Tail dark grey w^th Some more whitishness about y^e Setting on than towards y^e End w^ch is blunt & Squarish, under y^e Tail next y^e body tis yellow qu^d if y^e colour or some waxy foreign matter Stuck there for y^e flyes use, the legs are Small & black, y^e wings pretty broad, longer than the Tail, & when y^e fly sits they hang down a little on each Side, they are speckled Sad upon white y^e Sad thicker in two cross barrs on each wing.

42. Scarabeus fulvus oblongus, pedibus & Cornubus praelongis. Taken on a Road about y^e middle of June. The head is longish, y^e Eyes on each side small & black between w^ch a furrow lyes on y^e top of y^e head below y^e Eyes come out 2 long horns bending round towards y^e Ends Sad orage towards y^e head & growing Sadder upwards jointed all y^e way, & growing more whitish at y^e End, y^e Scapula or body part is cloth colour & unequall, y^e tail part is square at y^e Setting on & broad & tapers to y^e End where it is blunt the Vaginae are pale Chesnut smooth & Shining, the whole under part is cloth colour & Shining except at y^e End of y^e tail, where it is Sad Orange, as are the legs except the joints of y^e four formost & y^e thighs of the hindmost, they are long & end in one long toe at y^e end of each of w^ch are two crooked Claws.

---

43. Phalaena media grisea, alis maculis cruciformibus notatis, oculis atris.
Taken at the End of June on a Ladyes clothes. The head is short & pointed y^e Eyes prominent & very black, from each runs a black stroke to the sholders, y^e horns are white at y^e Setting on, & after black, Small, & ending in a point, y^e back between y^e head & wings is very hairy, y^e wings are light grey with Cross like marks of sad which are edged with white, y^e Ends are Scallopt, y^e under wings are white & Shine like Sattin, & Scallopt also, & Sadish at y^e Ends. y^e under Side of y^e upper wings, have Some Sad Spots on y^m, y^e tail is large & very hairy, blunt at y^e End like y^t of y^e papilio of a Silk worm, & grey, but whiter along the middle of its underside, y^e thighs are thick set with white hairs, the legs black & white in small alternate spots.

44. Apis ex sordido virescens alis supernis variegatis, infernis ex albo transparentibus.
Taken y^e middle of June, the head is flat faced w^thout horns, or other furniture but what is under y^e beak at y^e mouth, 2 is y^e appearance the face makes in a Glass, out of y^e mouth come three Setae, it looks of a greenish Sad colour, y^e upper part of the body & tail is black except just at y^e neck where a pale or whitish Circle goes round it y^e edges of y^e Tail are fueillemort, the 2 upper wings w^ch are longer than the body are Sad with 2 whitish marks on the outer edge as in 3 the 2 under wings are whitish & transparent, y^e leggs are greenish, & black points at y^e Joints, prettily inserted as in 4
The Glass discovers Short Setae at the End of the Tail.

45. Eadem (cum 40) tota viridis this differs in nothing but that is wholly green without any blew as that (40) hath. perhaps the diversity of Sex in y^e^ Same fly. Taken middle of June.

---

46. Taken y^e^ Middle of June. This is very Near of kin to n^o^ 39. The difference, The head of this is a little rounder, y^e^ back shines more blackish, the tail is slenderer & the whole is of one colour, & the wings shine more with rainbow colours I suspect it the male to 39, because tis less. y^e^ nose is bla.

47. Taken at y^e^ Same time. This is not much unlike y^e^ last but not 1/2 so big, y^e^ back is not so big in proportion nor doth it Shine so, y^e^ wings are not so long as y^e^ tail & dusky.

48. Musca fusca cauda fulva. Taken in y^e^ middle of June, much of y^e^ Shape of 40 & 49, & y^e^ wings lye horizontal like them, The Eyes are Sad & take up all y^e^ upper part of the head, & meet the nose is black with a white Edging, The body or Chest is Shining black, y^e^ wings Sad at y^e^ Setting on, & longer than the Tail, which is dark Orange with a black line down the length, & y^e^ Edges of y^e^ rings black, & underneath all sad yellow except y^e^ tip w^ch^ is black, the whole tail is downy, the legs are black, & the toes white.

49. Scarabeus minor fuscus compressus aquatilis.
Taken in y^e^ water in our ponds, about y^e^ middle of June, The whole is of a Sad colour, The head not to be discerned from the plate or Thorax having 2 very slender horns which by a glass appear joynted, & by y^e^ Same help 2 Small black Eyes are Seen on each Side the head, The Vaginae Shine, & are especially near y^e^ Setting on bent inwards wth a fold to go under part of the body this Contrivance is to preserve the true wings from being wetted when they swim, the under part is Sadder than y^e^ upper, the 4 forelegs are brown & armed wth 2 Claws at y^e^ toes, to Creep with, & issue out of y^e^ fore part of the Thorax together the hinder legs issue out of y^e^ Tail pretty low & end in flat fins, to swim with, w^ch^ they do very nimbly diving down to the bottom as soon as one approaches them, they will lye frequently at y^e^ top in the Sun, very still to bask.

---

50. Phalaena pratensis Mouffeti 3a p. 98
Taken about y^e^ midst of June flying in y^e^ day w^ch^ it frequently does in meadows tho' in y^e^ day. The whole body head legs & horns are very black the wings extend beyond y^e^ End of the tail; each of y^e^ upper wings is near black w^th^ a long scarlet streak where y^e^ black is in y^e^ picture and 2 Scarlet spots at y^e^ end of each wing, y^e^ inner spot biggest, y^e^ inner edges are Scarlet also. y^e^ underwings are Cherry colour, except y^e^ edges w^ch^ are Sad, all 4 wings are finely fringed at y^e^ Ends.

51. Phalaena pratensis Mouffeti prima p. 97. Taken 29 June in Coitu on a Stalk of Corn. There is no visible difference between y^e^ male & female, It is like the last, but y^e^ body & tail is much bigger, y^e^ horns also are thick at y^e^ Ends, y^e^ Sad of y^e^ wings shines more greenish, & the Scarlet on y^e^ upper wings is disposed into 5 fair Spots, & 2 smaller on y^e^ Edges, w^ch^ last is not in all. y^e^ underwings are much less than y^e^ upper, w^ch^ Mouffets figure observes not
the wings are pendulous & not extended as in y^e^ figure

52. About y^e^ End of June I found an Aurelia hanging upon a twig, w^ch^ I put into a box, & w^n^ I came to look on it, it had produced a Phalaena, w^ch^ I call Phalaena albo fusca variegata. The whole body is a pale cloth as are y^e^ under wings, the upper ones are variegated as I. w^ch^ is done by y^e^ life, y^e^ Aurelia was left thus with a rictus where the fly comes out, & confirms me yet more in my opinion y^t^ y^e^ head of y^e^ Caterpillar is y^e^ tail of y^e^ Butterfly.

---

53. Scarabeus Maialis gloriosa Splendens Grenoviensis. Taken flying in Greenwich Streets, y^e^ end of May; It Shines green all over y^e^ upper Side, & copper under y^e^ Tail; It is of y^e^ May bug kind, y^e^ head is Small & square, y^e^ Thorax or Sholder plate larg & almost Shaped like an heart from y^e^ hinder part of w^ch^ in y^e^ middle a triangular plate goes down between y^e^ Vaginae, these are marked w^th^ 3 Strokes of a whitish or Straw colour each & reach not to y^e^ End of y^e^ tail w^ch^ hangs down. y^e^ under part of y^e^ Thorax shines between Copper & green, & is thick Set w^th^ brown hair y^e^ under part of y^e^ Tail is copper, & round y^e^ Edges hairy, w^ch^ hairs imitate y^e^ white marks in y^e^ common

brown May bugg. The 2 first Joynts of all y^e^ legs are hairy & large with many points or prickles set on y^m^, & y^e^ last joynts are Small & weak as in y^e^ common one.

54. Scarabeus minor Ovalis splendens, tardipes, vaginis punctatis. Taken y^e^ beginning of July on y^e^ water Tub. It is an oblong Lady bird, y^e^ head is Small & Stands down & shines green, y^e^ Thorax plate Shines more gold like, & y^e^ Vaginae between green & copper, y^e^ back rises round & gibbous y^e^ Vaginae appear w^th^ a Small help of a glass pitted full of small holes y^e^ horns are pretty long black & jointed in a glass y^e^ true wings are large, & of a fine red, except y^e^ transparent ends, y^e^ whole under part of y^e^ body is black; it goes slowly.

55. Musca media fusca; Taken y^e^ middle of July upon y^e^ flowers of Lovage. The head is pretty round y^e^ Eyes reddish, & do not quite meet, a Small white Circle going round y^e^ Inward Sides of y^m^, y^e^ whole is of a Cloth colour body & tail, y^e^ legs are pretty long & black. y^e^ wings somew^t^ brownish just at their Setting on.

56. Phalaena fusca, alis 4 maculi insignioribus notatis. Taken flying about a Candle in y^e^ Garden y^e^ beginning of July, It is all sad colour'd except y^e^ under wings w^ch^ are ash, y^e^ upper wings are marked as in the figure with a Sadder colour y^e^ Eyes are near black & prominent. when it Stands y^e^ wings lye horizontal, & y^e^ under ones are quite cover'd by y^e^ upper

57. Musca Major caerulescens. Dni Hook. Micrograph. Schem. 26. where there is a full description Microscopical [****] [cut off]

---

58. Musca parva nigra Splendens, caudâ tumidâ aculeatâ Taken about y^e^ 7^th^ of July, y^e^ head is taken up by the Eyes w^ch^ are reddish Sad & meet, y^e^ 2 little hanging horns are black, y^e^ whole is black Steely shining, y^e^ tail swells out on each Side & ends in a Sharp point, y^e^ wings are shining with Iris colours.

59. Musca parva nigra Splendens sine aculeo, capite rotundiore, taken Same time, on y^e^ flowers of Levisticum.
This differs from y^e^ last in being longer, y^e^ head rounder & Set further from y^e^ Sholders, y^e^ Eys Stand on each Side, & are redder & Shining, the body or Thorax shines not so much, y^e^ tail is Set more slenderly as in y^e^ wasp kind, & Shines of a remiss copper colour, & hath no point at y^e^ End, y^e^ legs are long, slender & browner.

60. Culex cornubus plumosis D. Hook Micrograph. Schem . . . where is a figure & Description

61. Papilio fusca, alis externis macula nigra quasi oculata insignitis. Taken y^e^ beginning of July on y^e^ Grass in y^e^ field, Two Short brush come forth between y^e^ Eyes, w^ch^ are redish Sad, the whole head body horns & upper wings Sad, & Somewhat Shining, y^e^ Under wings are orange in the middle most parts Shaded & Clouded wth Sad, at y^e^ Corners Stands a full black Spot w^th^ 2 Small white Specks in it, y^e^ under part of y^e^ inner wing 1 is y^e^ most vivid Side, as is the under part of the upper wings, finely parted in wavy w^th^ a lighter colour near y^e^ Ends.

62. Scarabeus ex minimis, ex fusco aurantius, found y^e^ beginning of July, a Small oblong dark orange colour'd Slow paced Small Beetle, among Indian Seed Dustoa Vitlu

63. Scarabeus melanocyaneus Mouffeti p. 160
Taken in y^e^ End of June, It is all over very black, the figure is sufficient for y^e^ rest, only tis made not round enough.

---

64. Blatta Mouffeti p. 138 ubi[?] icon habitur tam maris quam faeminae.
Taken about our house in London, where are multitudes of various Sizes, so y^t^ it appears they grow after exclusion. vide Swammerdam

65. Scarabeus minor rotundus ruber, vaginis 2 maculis insignitis taken 8 July. a Small Lady bird, y^e^ Thorax plate is bla. w^th^ a white Spot on each Side, & an oblong one next y^e^ neck & two very Small ones next y^e^ mouth as in 1. y^e^ under side is all black, y^e^ true wings brown.

66. Scarabeus elasticus major. this is imperfectly mentioned in N° 4 of these papers taken in June, y^e^ whole is a dirty Sad colour, y^e^ head Small, y^e^ Eys Scarce discernable y^e^ Thorax plate larger than y^e^ figure & pitted in next y^e^ body, y^e^ Vaginae a little Striate, y^e^ under part of y^e^ Tail, smooth & strongly armed divided by 5 or 6 Shells of armour y^e^ legs of a middling length when toucht it falls down as if dead, & when laid on y^e^ back will Spring up by a Spring Seated in the neck, w^ch^ Snaps when put in action.

67. Scarabeus elasticus minor. This hath y^e^ Same Springing property with y^e^ last, y^e^ head very Small, w^th^ 2 Small black Eys, y^e^ Thorax plate blackish, y^e^ Vaginae chesnut, & reach all round lower than y^e^ edges of y^e^ body, y^e^ under part of y^e^ tail of y^e^ Same colour, y^e^ Thorax plate is continued part of y^e^ way on y^e^ Tail

---

68. Phalaena media Straminea. Taken at night by a Candle among nettles July 8. The whole is of a Straw colour, y^e^ Eyes black, y^e^ upper wings have faint reddish undulated lines on y^m^, y^e^ under wings are as long & near as large as y^e^ upper, the legs are pretty large Stronger & brown, as I stuck it down it laid many very Small round white Eggs, y^t^ stuck not the tail is darker colour'd especially towards y^e^ End, it sits w^th^ its wings hanging down in 2 or 3 houres the Eggs turned black.

69. Phalaena alis ex fusco virescentibus maculis nigris insignitis. Taken by night in y^e^ Same manner, the head is ash ending in a longish proboscis, y^e^ Eyes Sadder y^e^ horns pretty long, ash colour'd & Standing at right angles w^th^ y^e^ head, y^e^ upper wings are greenish towards y^e^ upper edges, & Ends w^th^ lines running toward y^e^ End not colour'd but a wrinkle & end in a black Spot y^e^ ends fringed brown, y^e^ middle parts of a Shining purplish Sad, on y^e^ upper part of w^ch^ are 2 black Spots, y^e^ legs are branched, y^e^ under wings ash Shining, y^e^ tail Sadder, as it was Stuck with a pin it laid many oblong white Eggs, w^ch^ was done by thrusting out a long Tube a good way from y^e^ End of its Tail, w^ch^ it wriggled about & one might See y^e^ Egg come through it, w^ch^ Stuck to y^e^ place where it was laid, this Tube it pull'd in & put out many times before an Egg came.

70. Scarabeus medius fulvus, vaginarum extremitatibus nigris. Taken 8 July in coitu On y^e^ flowers of Levisticum, It agrees exactly with y^e^ description of N° 23, except, y^t^ in this y^e^ toes are only black, & the ends of y^e^ Vaginae & it hath no black on y^e^ forehead.

71. Musca alis subfulvis. Taken 9^th^ July by the River The Eyes almost meet, are of a Sad chesnut & large, the nose is Steely shining, the Thorax is sad, the tail a little lighter & Shining remissly on both Sides, & ending in a yellowish point underneath the wings are brown, especially near y^e^ Setting on. y^e^ legs Sad.

72. Musca media cauda ex luteo & nigro variegata alis Iridis modo splendentibus, take w^th^ 71. The head pretty large as are y^e^ sad chesnut Eys y^e^ parting between w^ch^ is Steel Shining, y^e^ back shines blacker, y^e^ upper part of y^e^ tail is yellow crost with bla. y^e^ underpt yellow, y^e^ legs browner yellow. the wings w^n^ objected to y^e^ light Shine vivid w^th^ red & green

---

73. Musca fusca media, pedibus longis, alis maculâ insignitis, Taken with y^e^ last, y^e^ head is not big, y^e^ Eyes reddish Chesnut w^th^ a large ash colour'd division between The Chest is gibbous Sad strip'd wth Sadder, the tail lighter above & Shining ending in a point, & underneath almost wholly bla, y^e^ wings are pretty large brown & Shining with a black Spot in each as in y^e^ figure this is very different from N° 38

74. Scarabeus ex minimus chalybis colore & splendore alter, alis caeruleo tinctis. Taken with y^e^ last, The whole Shines blew as Steel, y^e^ under part black, y^e^ horns have no knoks but are somew^t^ thicker at y^e^ End, y^e^ true wings look blewish, w^th^ Iris colours & have a Small black speck on y^e^ middle of y^e^ outward Edge.

75. Idem longior ex utroque splendens cornubus longioribus. Taken with y^e^ last both sides & every part Shining the blew is Somew^t^ greenish, it is longer, & the horns longer also.

76. Papilio fusca alis Subtus 16 maculis oculatis notatis. Taken by the River w^th^ y^e^ last The upper Side of y^e^ wings is all Sad, w^th^ long hair especially near y^e^ head, the under Side of the wing is

marked as in y^e^ figure, 3 in each upper wing & 5 in each under wing, in these Spots y^e^ first ring in orange, w^th^in y^e^ black, & in y^e^ Center a white spot, y^e^ body head & horns are Sad, & y^e^ legs a little browner.

77. Papilio fusca alis internis oculatis 61. quodammodo accedens. Taken by y^e^ River with y^e^ last. This is darker all over than 61. The Orange appears not so much on y^e^ back of y^e^ upper wings, but more underneath, where it is almost all Orange The under part of y^e^ under wings is y^e^ greater 1/2 Sadder, & to y^e^ Ends lighter with 3 black Spots in each towards y^e^ bottom, The Eyes are black, Edged w^th^ white backwards, & before just by y^e^ Nose brown. I have one just like y^e^ Sort only w^th^ 2 Spots on each under wing

---

78. Musca bipennis ditricha; an an 3^d^ Mouffeti p. 63. Taken 22^th^ July floating on y^e^ water, from whence I suppose it was newly emerged, being produced as I guess in the water. y^e^ whole is greenish Orange, except y^e^ end of y^e^ tail which is deeper, the Eyes are Small & black standing on each Side of y^e^ head before w^ch^ are 2 very small fine horns, the Thorax is pretty thick, paler on y^e^ Sides, as is also between y^e^ Thorax & y^e^ tail the End of w^ch^ grows thicker, & at y^e^ Extremity come out 2 long Small hairs a inch in length marked w^th^ Sad Speeks upon white, Scarce visible without a glass, (perdicei coloris Mouffet) the under part of y^e^ body is brown; the legs are but 4 & green in y^e^ forepart of y^e^ Chest under y^e^ head come 2 Small Stumps as if they were legs broken off. The wings are very large, y^e^ upper Edge greenish, y^e^ rest transparent.

79. Eruca elegans flavis striis.
Taken y^e^ End of Aug. in a Clover field a very Sad brown broad Stripe runs down y^e^ length of y^e^ back on each Side of w^ch^ runs a narrow yellow Stripe edged with white, y^e^ on each Side another broad lighter brown Stripe edged with black, under that on each Side a yellow Stripe like the former, y^e^ upper part edged with white & y^e^ under edged with grey, y^e^ head & legs are of a reddish flesh colour, y^e^ Legs are 6 Sharp ones at y^e^ head, 8 flat ones in y^e^ midst & y^e^ 2 holders at y^e^ Tail, after it had fed some time upon Lettuce it hid it self under one of the Leaves w^ch^ it fasten'd to y^e^ box, & changed to a very dark brown Aurelia, w^ch^ in Some day turned black

---

Miscellany Thoughts about Vegetables.
The consideration of the Infinite Power, wisdome and goodness exhibited in the Immense Variety of beings wherewith the Great Creator has furnished this world naturally leads us to y^e^ admiration of those adorable Perfections so eminently display'd in his works. Amongst others the Vegetable Kingdome affords instances in as vast a Variety as the Plants are which He has made, whether we consider their Numbers, differenees, Figures diversity of ways of vegetation & producing their kinds, Structures, Vertues & Uses, In all which Since a regular distribution of what might be said will be operose & difficult to reduce to a good method, Such thoughts and Observations as occur are here set down for y^e^ present till they can be brought into a more just Order.

---

1. The universal [****] tends to preserve [****] & perhaps of all other Animals.
2. The flowers being of different colours does at a great distance direct Bees, & divers other flying Insects, whither to repair for Food.
3. Perhaps Plants may serve amongst other Uses, to strain & correct some noxious Juyces before they come abroad into y^e^ Air, by their passing through their Vessells.
4. I do not remember any Tree to have down on it's Seed, Such as pappescent Plants have, they not needing such ways of Conveyance for their Seeds to be sown at a distance from them, their Tallness putting their Seeds so high into y^e^ Air that y^e^ wind can carry them remote enough
5. The same of water Plants, whose Seeds are Sufficiently dispersed by bare falling down into y^e^ water y^e^ flowing of which carryes them into distant places.

---

6. [****] generally very smooth y^t^ the water may slide easily off them without any way bruising their Vessells

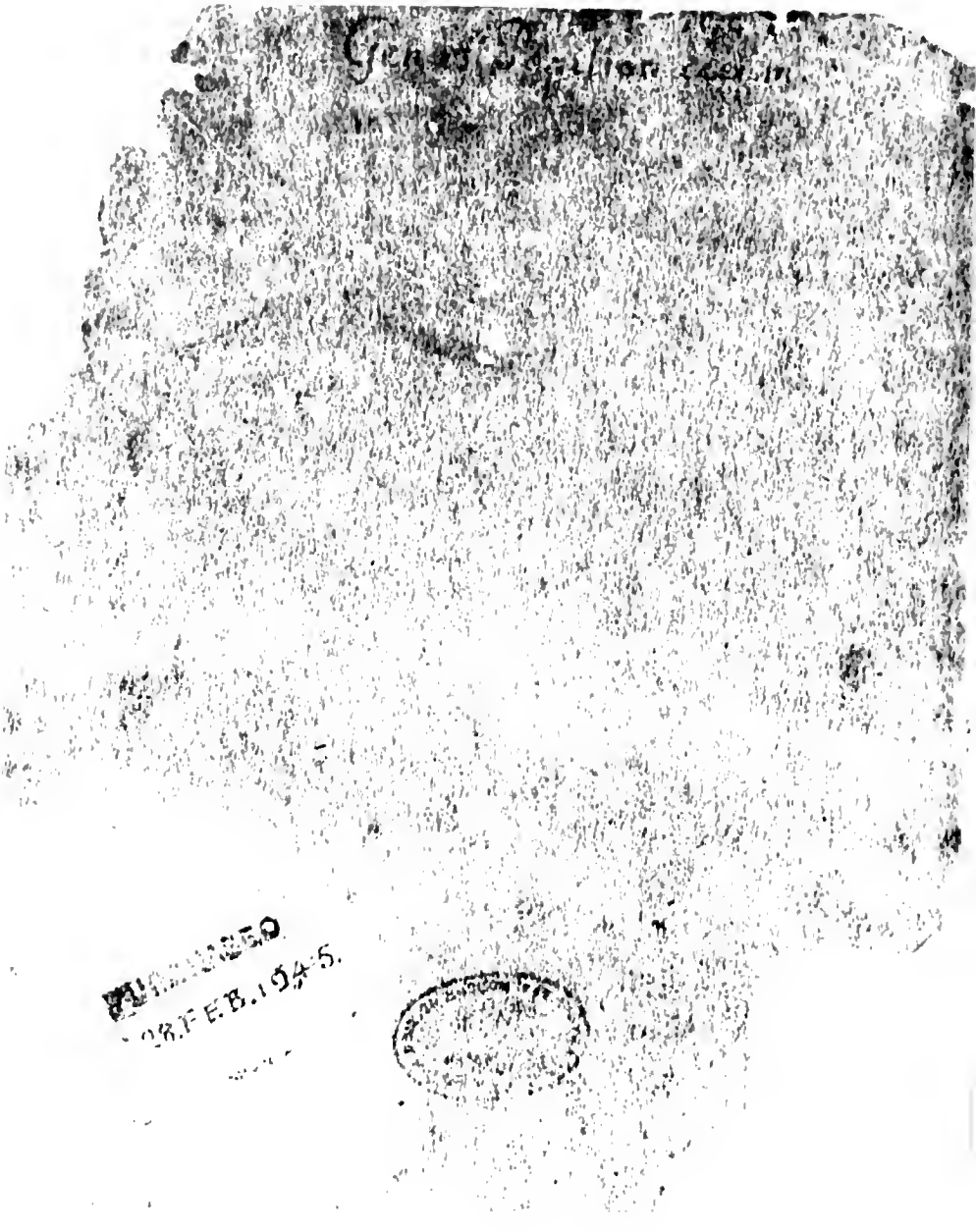
7. The flowers of water Plants stand above y^e^ Surface, & the Seed y^t^ follows which would not otherwise be dry to ripen
8. Birds do often supply the place of a Sower in Berrys especially that have stony seeds, which pass through their Bodies, without losing their aptitude to grow again, & being dung'd into the Bargain.
9. The surface of the Leaves of Herbs good for Food are Smooth & free from down, which would be unpleasant in the mouth, & not easy to digest, as Cabbage, Lettuce, Beets, purslane Parsley, Endive &c

5

Insecta K.

MS. notes on Insecta, with original drawings written and drawn by a collector in 1692 1695.

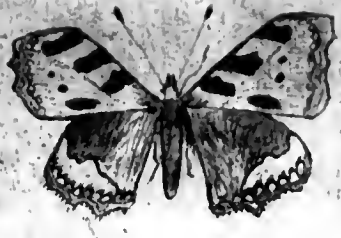
Purchased from Prof. J. Percival,
"Leighton",
Shinfield Green,
Reading,
Berks.


08 FEB 1945

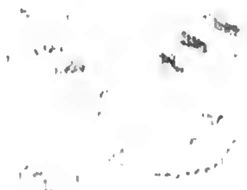
[illegible]
Papilio [illegible], an 12 Moufeti pag. 101.

Taken ye 19 July. It is a nimble fly, & sits wth its wings erect, sometimes clapping them down. The lowest figure in Moufet p. 101 agrees pretty well with it, but his description is not exact.

The whole body & head is a deep sad, with long sad brown hairs, especially on ye Thorax. ye horns are long & jointed, ye knob ends in yellow, ye Ground of ye wings on ye upper Side is a full Orange, the upper wing is the smaller, at ye setting on it is dark, 3 large black spots are placed on ye upper [illegible] on each side ye middle one, ye ground is buff [illegible] ye 3d near [illegible] is white; [illegible] with long brown hairs, The [illegible] then a row of circles filld with peach in ye [illegible] black & brown lines undulated, ye [illegible] upper side [illegible] & instead of Orange pale buff colour. 1. One large black spot is at ye under [illegible], & 2 smaller [illegible]. It lives through ye winter, it is often found [illegible] in [illegible], upon [illegible]. The figure is expanded [illegible] for ye sake of seeing all ye wings.



2

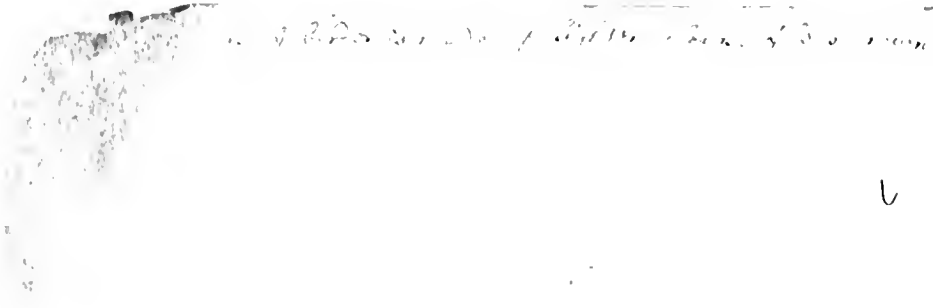


[illegible]

Papilio alba, alis 6 maculis nigris notatis, extremitatibus etiam nigris.

[illegible] 1718 [illegible] in ye Garden. The head is white ye [illegible] [illegible] black ye Thorax & tail black very thick wth white hairs, ye horns wth [illegible] black knobs the upper side of ye wings white the upper wings have 2 black spots each, & the ends black, ye underwings have each one black spot on ye outward edge On ye Under Sides, ye tips of ye upper wings, & all ye under wings are brimstone colour, ye upper wings have 2 black Spots each on ye under Sides, ye legs are greenish white.

3



5

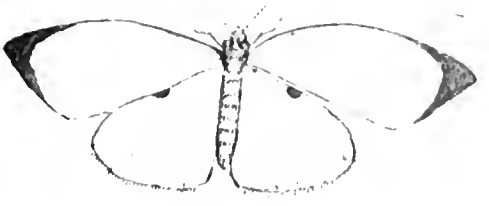
(1)
Papilio Sulphurea alis angulosis

Taken ye 16 September upon ye flowering [illegible]
ye [illegible] red crown, ye upper part of ye head, & [illegible]
[illegible], ye same colour, [illegible]
[illegible] distinctly [illegible], the [illegible] of ye [illegible]
[illegible] wings of crimson colour, in one deeper, in another taken
[illegible] paler, [illegible], & that part of ye [illegible] next is is very
[illegible] with small [illegible] placed [illegible]
[illegible] in ye midst of every wing there is an Orange spot, [illegible]
in ye upper wings, [illegible] in the under ones; [illegible] edges of the
wing [illegible] Orange spots set at some distance from
each other

6

6 Papilio alis laciniatis

Taken 23rd Septr The head & body are sad brown, ye horns of ye same colour except ye tips of ye knobs wch are [illegible], The proboscis & legs are brown, ye latter pretty long, the wings are cut in & variously indented on the [illegible], [illegible] [illegible] marked with [illegible] spotts & clouds, [illegible] [illegible] manner, with shades of [illegible] & browns, ye upper [illegible] ye [illegible] part lighter, in ye place where [illegible] [illegible] ye under wings is [illegible] mark like a C [illegible] &c.



8

Papilio elegans [illegible] Bella Donna [illegible]

taken 27th of September upon ye flowers of [illegible] It is very
shy & difficult to come at, the Eyes are black, ye head set [illegible]
brown hairs, ye horns black tipt with white at ye ends, [illegible]
black, set with brown hairs, ye upper part of ye tail black [illegible]
with red, ye under part ash coloured, so are ye Legs [illegible]
pretty long, ye first pair plumose, serving [illegible]
[illegible] I suppose. The upper side of the upper wings [illegible]
ground, ye 3 [illegible] inner marks Orange in [illegible]
[illegible] other [illegible] perhaps they are of different sexes. ye 5 spots at
ye end are white, ye under sides are [illegible]
The upper side of ye under wings [illegible] with [illegible]
ye Orange spotts with black. ye under side is [illegible]
[illegible] colours interspersed with white [illegible]
[illegible] at ye bottome.

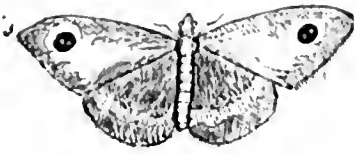
9

Papilio minor alis aurantii coloris, maculatis, & pulchre splendentibus.

Given me by Mr Petiver 23th September who took it ye same day coming to Mitcham; It is small, ye horns are broken off, ye Eyes [illegible] the Head & body are black, ye Legs are coloured, the upper Sides of ye upper wings are Orange with a Shine, set with black spots, which on ye other Sides are Eyes, & the Orange Paler, ye border of ye wing is Sad; the under-wings are clad with a [illegible] dull Orange, Scallopt with Sad, & fringed, ye under [illegible] part Sad, set with several Specks, with ye Scallopt border.

101

Papilio fusca, alis ~~extrnis~~ ocello nigro insignitis.



Taken ye beginning of July on the Grass in ye Fields. The Eyes are reddish Sad; the whole head, Horns body, & under upper wings Sad, & somewhat Shining, the upper wings are Orange Sad, shaded & clouded with ~~Sad~~ Red about the middle of them, towards ye Corners of each stands a full black Spot, with 2 Small white Specks in it, The under side of both pair of wings is the most vivid, that of ye upper wings is finely parked in wavy with a lighter colour near the ends.

11.

Papilio fusca alis subtus
16 maculis ocellatis notatis.

Taken 6th July by The River Side. The Head, horns, body & upper side of ye wings are all Sad coloured, these last are Bt with many long hairs especially near ye head, the Leggs are brownish. The under Side of ye wings is marked with Eyes as in ye Figure, Three in each upper wing, & Five in each under wing; In these spots the first ring is Orange, within that Black, & in the Center a white Speck.

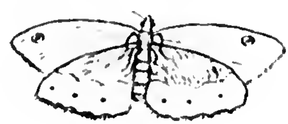
12

11

Papilio fusca, alis internis oculatis 10 quodammodo accedens.
Mouf No 4. p. 103. fig:

Taken with ye last. This is darker all over than No 10. the Orange appears not so much on ye back of ye upper wings but more undeneath, where it is almost all Orange. ye under part of the under wings is mostly sadder. & ye Ends lighter, with 3 black Spots in each towards ye bottom. The Eyes are black with white Edges behind, & before just by the nose, brown; I have one just like this but only with two spots in each under wing.

12



8

Genus Phalænaceum.

The Notes of a Phalena, whereby it seems chiefly to differ from a Papilio, speaking generally, are

1. To fly by night or after Sun-set.
2. To sit with its wings dependent, or horizontal, & not erect
3. To be heavyer & duller, at least to appear so by day.
4. To be more hairy, to defend yᵉ from yᵉ Injury of Night-Dews.
5. To have weaker & slenderer horns, ending in a point, without a knob at yᵉ End; & to be in some Kinds plumose.

1. Phalæna minor alis ex fusco & rufo mixtis, macula Staminea.

Taken 23 July in yᵉ morning. The Head & Horns are Lig Tawny, the Eyes greenish, yᵉ Body & tail light Tawny, & shining, yᵉ legs also, & set wth 2 or 3 stiff hairs about yᵉ middle the wings underneath are reddish Straw colour; above they are redder. yᵉ upper wings have each 2 Straw colour spot at yᵉ outward edge yᵉ under, two small fringes each of yᵉ same colour, & a fringe wth a light Tawny.

2

2 Phalena alba parva graminea. The Gras Moth
taken 3 July. They fly in meadows in
the Evening in Numbers, keeping near ye
ground making short flights, & lighting a
stalk, where they are not easily seen
because their wings lys close one on another
along their body. The whole body & wings are of a light ash
colour & shining, ye Eyes are black, from ye Nose 2 long
proboscis come forth, ye horns are slender & blackish, ye legs
are long & somewhat branched.

3 Phalena. 3a parva graminea minor

Taken at ye same time & place. The
difference between these is only That this
is smaller, & ye underwings deep ash,
fringed with white, perhaps this is the
male;

4 Phalæna minor splendens, capite fusco, alis ex [illegible] purpureo & fusco mixtis

Taken 23 July in ye morning early, flying. The [illegible] black, ye Eyes sad & shining, ye horns of ye same [illegible], ye body & tail light ash, with a Shew of purple, Shining, ye legs sad, shining and a little branched. The wings underneath of ye colour of ye Tail, but sadder towards ye outer Edges; Above, ye upper wings are marbled with sad & a pale purple, [illegible] ash, fringed, & Shining. The figure is a little less than the life.

5 Phalæna minor, alis ex fusco & cinereo mixtis

Taken flying at ye same time. The [illegible] Eyes black, ye body & tail ye same, the Edges of the wings and Tail are whitish, underneath all Shining ash, ye legs [illegible] a little branched, ye upper wings are [illegible], with 4 marbled darker spots on each, ye [illegible] wings Shining ash, [illegible] as are those of [illegible] Phalænæ.

25

6 Phalæna [illegible] minor alis maculâ fuscâ obscurâ [illegible]

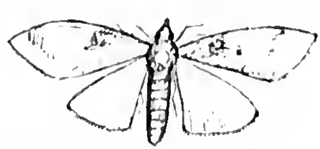
[illegible] The Eyes sad, ye whole upper part is [illegible] lighter underneath, marked as (2) which is ye underside of ye upper wing. The upper wings are [illegible] small [illegible] ye ash coloured [illegible] are [illegible] somewhat [illegible].

6

2

— Phalæna [illegible] media dorso nudo.

[illegible] in ye evening about ye ~~end~~ myddle of July. It flyes very swift, & [illegible] about ye flowers. The Head & Thorax are thick & bluff, coverd 1
with long ash coloured hair, except the midst of ye back wch is naked
coverd with an Orange shining Skin. I am in some doubt least I rubd
[illegible] hair when I took it, but I caught [illegible] & when I took [illegible] they are all so. The upper wings have [illegible] spots like a (y) & are [illegible] with dark upon ash as in the figure, [illegible] ye Thorax is very [illegible] hair, ye [illegible] are sad, a little [illegible]. This [illegible] is not dorso nudo [illegible] of ye Gamma, [illegible] on the wings.



Phalæna media, alis fusco, fulvis, [illegible]

[illegible]ken 23th July in the Evening. It is such another as ye last but not so big, wth a naked back like it. The [illegible] body & legs sad, ye Eyes black. ye upper wings marked sad & lightbrown as in ye figur[e] [illegible] wings all Sad; underneath it is all sad, with [illegible] reddishness.

9

9 Phalæna alba plumata

Taken in ye Evening July 23th flying. The [illegible] The Tail hath a Shew of greenishness, about [illegible] an inch long, & Slender. The Legs are very long, [illegible] [illegible] short, & [illegible] very [illegible] is made of 2 perfect Feathers joyned together near their Origine. ye Antenna ½ an inch long.

10 Phalæna cinerea alis maculatis, cornubus plumatis.

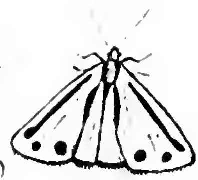
Taken 26 July in ye night by a Candle. it's all over [illegible] colour wth Sad colour marks on ye upper wings as in ye figr. ye horns are brownish & appear thick, but in a good light are made like an [illegible] bone or [illegible] feather as (2) not [illegible] opposite but sitting [illegible] [illegible] [illegible] & a little [illegible].

11 Phalæna minor cinerea alis marmoreis.

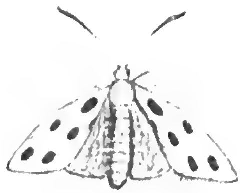
[illegible] in ye night [illegible] July 27
It is all one colour except ye upper wings
wch are marbled wth sad Strokes as in ye fig:

[illegible] is long, ye horns small & Short, ye Legs long, & a little
hairy, ye whole under Side is sad ash.

12 Phalæna pratensis Clouffeti 3a p. 98.
Taken about ye midst of June flying in a
meadow by day: The whole body, head, horns
& legs are very black, the wings extend beyond
the end of ye Tail, each of ye upper wings is
almost black with long Scarlet Streak where
the black is in ye picture, & 2 Scarlet Spots at the end of each
wing, ye inward Spot biggest, ye inward edges are Scarlet also
the under wings are wholly cherry colour'd, except ye Edges, which
are sad, ye under & upper Sides of both pair are alike, & they are
all [illegible] fringed at ye Ends.



Phalæna pratensis Moufeti prima
pag. 97.



Taken 29th June in Coitu on a Stalk of
Corn; there is no visible difference be:
tween ye Male & female. It is like ye
last, but ye body & Tail is much bigger,
The horns also grow thick towards ye
Ends, the Sad of ye wings shines more greenish, & the colour
on ye upper wings is disposed into 5 fair Spots, & in some 2
more on ye inner edges, the wings hang down, ye under wings are
much less yn ye upper ones, wch is not observed in Moufets figure

14 Phalæna albo-fusca alis variegatis

About ye End of June I found an
Aurelia hanging upon a Twig, wch I put
into a box, & when I came to look on it,
it had produced ye Phalæna above named
The whole body & under wings are of a
pale cloth colour, the upper wings are vari:
:egated, both wings underneath are of ye
same cloth colour with ye body. The Chry:
:salis wch is drawn too little, was left thus

& seems to confirm ye Notion, yt the head of ye Catterpillar is
that end wch is ye tail of ye Butterfly.

37

15 Phalæna fusca alis 4 maculis insignis [illegible]
notatis

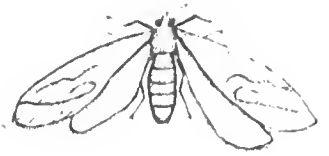
Taken flying about a Candle
in the garden, in the beginning of
July. It is all sad colour'd except
the under wings which are ash, the
upper wings are marked as in the

figure with a Sadder colour, the Eyes are near black &
prominent; when it Stands, ye wings lye horizontal, and
the under ones are quite cover'd by the upper

16 Phalæna media grisea, alis maculis cruci-
-formibus notatis, oculis atris

Taken ye last of June on a Ladye's clothes
The head is short & pointed, ye Eyes prominent
very black, from each runs a black stroke to
[illegible], ye horns are white at ye Setting on, & after black, small
ending in a point, The back between ye head & wings is very hairy
the upper wings are light grey with Cross like marks of ead wch are [illegible]
[illegible] with white, the Ends are Scallopt; ye under wings are
white & Shine like Sattin, & scallopt also, & saddish colour'd at ye
[illegible] ye under sides; ye upper wings have some sad spots on ym.
The tail is large & very hairy, blunt at ye End like ye of ye Papilio
[illegible] & grey, but whiter along the middle of its underside
[illegible] are thick set with white hairs, ye Legs black & white
in [illegible] [illegible] spots.

17



Phalæna media straminea.

Taken in y^e night by a Candle amongst Nettles July 8^th. The whole is straw colour'd, the Eyes Black; The upper wings have faint reddish undulated Lines on y^m. The under wings are as long & near as large as the upper, y^e Leggs are pritty large, strong, & brown; When it was stuck down to a box with a pin, it laid many very small, round, white Eggs, w^ch stuck not to y^e box, but rowl'd away as they came out, w^ch Eggs in 3 hours time turned black. The Tail is darker colour'd, especially towards y^e End. It Sits with its wings hanging down.

18

Phalæna alis ex fusco virescentibus, maculis nigris metallicis. Taken with the last. The head is ash colour ending in a long proboscis, y^e Eyes sadder, y^e horns pritty long & ash coloured. The upper wings are greenish towards y^e upper Edges, towards y^e ends Surrounded, w^th small black specks at y^e ends of y^e Furrows, y^e middle of y^e wings are of a shining purplish clad, on y^e upper part of w^ch two black spots a bigger & a lesser in each wing. The under wings ash colour'd & shining; The Tail clad ash, the Legs are long & somewhat Branched. While it was stuck down with a pin it laid many small oblong white Eggs, w^ch was performed by the [illegible] at y^e End of its Tail a long white transparent Tube w^ch it [illegible] about & thrust out & drew in often, & now & then a [illegible] Egg came through'd, w^ch it stuck by [illegible]

19

Phalæna tota alba

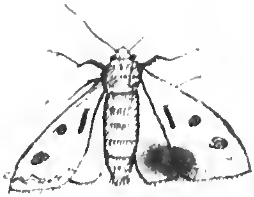
Taken in August upon ye Grass on Tunbridge Wells Common. It is all over white; The Eyes only wch are brown, ye Legs very hairy. After it was stuck down with a pin, it excluded much brown woolly matter, wherein it laid its Eggs, wch were there hatcht in 2 or 3 dayes. I fed them with young Lettuce Leaves, but they dyed in a week or 10 days, they were of the hairy kind of Catterpillers.

20.

Phalæna major elegans tricolor
...tab. 99.

This sort I hatched, & fed ye Catterpillar wch they commonly call Shepheards Dogs. The Eyes are sad brown, ye head & body thick set with brown hair, but at ye juncture of ye Neck & shoulders, Scarlet; The horns come out of a small scarlet knob, they are white set with 2 rows of very fine hairs, in manner of a feather. The ground of ye upper wings is pale Isabella marked with large sad intorted Spots, underneath ye Isabella is deeper; The under wings are pale Scarlet spotted with four black spots, underneath ye ground is pale Orange, The upper side of ye tail is deep Orange, ye under Side sad except at ye junctures of ye wings wch are deep Orange; The Legs are strong, sad, & a little branched, the upper part of ye Thighs Scarlet.

[illegible] Phalæna Jo Pean mihi.



[illegible] on y^e ground y^e beginning of June.
[illegible] all hairy, [illegible] about y^e head, y^e Eyes
sad, y^e whole except y^e whitish underwing
of a [illegible] colour, y^e End of y^e Tail thick
& [illegible]. The uppersides of y^e upper wings are
marked w^th a straight black stroke, & 2 roun[d]
ones less black, & are [illegible] towards the
Ends where runs across them a lighter undulating Stroke. The
Horns are long & finely feathered. I suspect this to be the male
of 25, when it was taken it was on y^e ground, & could not yet
fly, being as I suppose newly gotten out of its Chrysalis which
perhaps was buried, as was that of 25.

22

Phalæna aliquatenus purpurascens, unicolor
Splendens. Margarita mihi.

Taken y^e beginning of June. The Eyes are black,
the head not very big, y^e horns slender & pretty
long. The whole Body sad [illegible] upper sides of the
upper, & y^e Ends of y^e upper sides of the under wings are [illegible]
sad colour mixt with a faint purplish colour, towards y^e upper part
of y^e under side of y^e upper wings, & towards the [illegible] of the
underwings ~~of~~ on y^e upper Side is a fine [illegible] pearl colour.

39

23

Phalena cinerea, maculis ~~nigris~~ fuscis variegatis magnis notata.

Taken y^e beginning of June. The head is small & scal colour'd, as is also y^e Thorax, y^e horns small, the Tail ash coloured, y^e Wings also, upon y^e upper wings on the outward edge stand 3 large cad, mixt, spots, y^e upper two when the wings are clear making an equilateral triangle. the fringe of y^e upper wings alternately black & white

24

Phalena fulva striis transversis undulatis notata, interdiu sub arborum foliis degens.

Taken y^e middle of June, at which time if one shake y^e boughs of bushes one may see y^m frequently fly out & make to y^e underside of a leaf of the next bush. The whole is Tawny yellow or buff, the upperside of y^e wings are visibly marked with waved Lines of white or ladder stuff running transversly as far as about $\frac{2}{3}$ of y^e length of the wing the rest to y^e end is of a lighter buff, & more obscurely undulated

40

25

...lla fusca e Chrysalide
terrâ sepulta prorumpens

...ning of June found in
... Earth several whch old Brown...
... w put up in a box one of them
... this Phalæna about 14 Days after
... are black, y head that set on a thick hairy stuff the
... Covered with reddish old hairs, y taile thick & hairy
... of whitish at y annulary junctures. The horns
... & brown. y wings ... with paler strokes in them
... y upper part of y under wing in some positions shining
like peacocks feathers. but it had bt... it self in the box
... not curiously perfect. It had laid above 100 Round
... eggs in the box w^{ch} it had first fix'd by the glutinous
... about y^m in the quincunx order, & there fore is a female.
... One way of knowing the males from y Females
... Papilionaceous Species is by hatching their Chrysalis
... the Female soon lays her Eggs whether she doth coire or
not the ... this last case they are steril.

26

Phalæna alis angulosis, Linea transversa
ala. in duas partes dividens. Linea
æquinoctialis mihi.

... M^r Stonestreet at night by a candle
... window at Carshalton. It is of a Brownish
... head & horns small, y eyes very black, the ends of all
the wings are pink colour, a reddish brown faint line ... all the
... a smaller redder line undulates almost ...
... underneath it is set wth innumerable small
... lines are ... appearing on this side also.

27

[illegible] il ... equata ... nec tacem ... alis [illegible] pictis.

[illegible] seen about ye end of May in a Lane in [illegible] Fields. [illegible]

28

[illegible] fusca, alis [illegible] pertinentes maculatis, divisis.

[illegible] in ye Woodhouse [illegible] ye Lane. The head is yellowish brown [illegible] paler, & shining, the Legges wch are long [illegible] uppermost on ye under Side, of a Reddish brown [illegible] saddle [illegible] it were variegated, [illegible] upper part of the Tower [illegible] Tail, [illegible] Red, [illegible] brown, the outer wings are divided into [illegible] Side [illegible] a waved [illegible] Line on each Side. The [illegible] variegations, [illegible] with these [illegible].

29

Phalaena alba cucullata, alis duobus maculis majoribus ornata

Taken about ye middle of July,
The eyes are small & black, the head, horns, thorax, & beginning of [illegible] mixt so as to make a triangle, a large round spot [illegible] wing on ye outer Edge. [illegible] wings otherwise are [illegible] that towards ye [illegible] they are more ash coloured & [illegible] at ye tips, ye under wings underneath have a small black speck in ye midst of each, ye Leggs are speckled.

30

Phalena ochroleuca cucullata minor

[illegible] is ye sort yt is bred of those animalls that eat ye feathers of the skins of ye Stuft birds, they fly about them all ye Summer in the Evening

Scarabinum Genus.

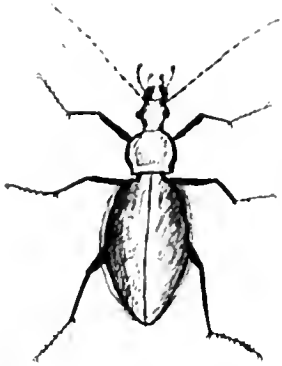
1.

1 . Scarabæus Terrestris nigro fuscus
Taken 9th September out of ye ground
as it was digging. it is all over almost
black somewhat inclining to sad brown
ye head is flat almost of ye figure of an
heart, furnished at ye mouth wth small
feelers, ye eyes small & black. below which stand ye two horns
near ¼ an inch long, & appear joynted if attentively lookt
at. ye Thorax is flat & sharp edged, ye Edges somewhat turned
up. ye Vaginæ smooth, shining & furrowd lengthways, the legs
towards ye Ends are brownish, somewhat longer than is common
ye hinder ones especially, wch are slenderer also.

2

Idem major vaginis non splendentibus
I remember not where or when taken
It differs not from ye last, except yt the
Vaginæ are of a sad dark colour, not so
black as ye last, & shine less, & ye legs
are wholly brown; This hath on ye under side of the Thorax,
just before ye setting on ye fore legs 2 small, round, brown, shining
prominent knobs, wch ye other hath not. perhaps this may be
the female, wch in most insects is ye biggest.

3

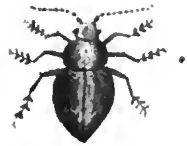


3 Scarabæus terrestris, corpore nigro oblongo tumido.

Taken 10 September, digging in ye Garden it came out of the Ground, it runs nimbly the figure is somewhat bigger than the life. It is all over of a dusky black, 4 large Feelers hang at ye mouth, just under ye Forceps, ye 2 uppermost longest, & having each 3 joynts, ye 2 undermost Shorter & jointed also, all ending in knobs, above ye Hands ye Forceps or pincers, with which it bites strongly, ye Eyes are Small, & black, under them the horns come out near an inch long each, & joynted. The Thorax flats is turned up at ye Edges, ye Vagina turn up at ye Edges all round, & towards ye Thorax Shine like Steel, ye tail reaches a little beyond ye Ends of ye Vagina, ye tail is very thick in ye middle especially rising up to a ridge in ye middle both above & beneath; underneath it is very black & Shining. The Legs, especially ye hinder ones are large & long: The Vagina shine remarkably, when seen through a Glass appear rugose.

15

4 Scarabeus melanocyanus Mouffeti p. 160.



Taken about ye End of June. It is all over very black, The figure is Sufficient for ye Rest.

5 Scarabeus ex minimis, ex fusco aurantius

Found in ye Beginning of July a small oblong dark Orang colour'd slow paced Beetle, mite among old Indian Corn & came to me formerly by ye Name of Dustoa Vittie.

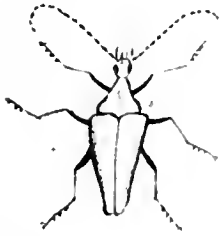
6 Scarabeus elasticus major. The bigger Castanet Beetle.

Taken in June. The whole is of a dirty Sad colour The Head Small, ye Eyes Scarce discernible, the Thorax plate pitted in most of ye body, The Vagina a little Striate, ye under part of ye Tail smooth and strongly armed, divided by 5 or 6 Shells of armour, The Legs of a middling Length, When touched it falls from ye place as if dead, when laid on the Back, it will jerk up by a Spring seated in ye Neck to a good height by wch mean it recovers its feet, when it springs it make a ... Snapping wch is ye Reason of its name.

7 Scarabeus elasticus minor, The Lesser Castanet Beetle.

Taken in . This hath ye Same Springing Faculty as ye former. The head is very Small, with two Small black Eyes; The Thorax plate blackish, the Vagina chesnut coloured, wch reach all round, lower than ye Edges or Sides of ye Tail, ye under part of ye Tail is of ye Same colour, The Thorax plate is continued over Some part of ye Tail.

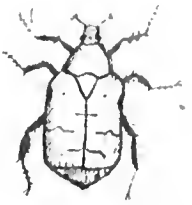
8 Scarabeus fulvus oblongus Cornubus, & pedibus prælongis.



Taken on a Rose about ye middle of June, The head is longish, The Eyes on each Side Small & black, between wch a furrow Eyes, & equall or ye head; Below ye Eyes come out 2 long jointed Horns bending round towards the Ends, Sad Orange towards ye head & growing Sadder upwards, & near ye Ends whitish, The Thorax plate is cloth coloured, unequall, & dspersed in Some places; ye Tail part is Squarish at ye Setting on to ye Thorax, & broad, & tapers to ye End where it is blunt, ye Vaginæ are pale Chesnut, Smooth, & Shining, ye under part of ye Tail is cloth coloured & Shines, only ye End is Sad Orange, as are ye Legs also, except ye joints of the 4 former st, & ye thighs of ye hindmost, wch are The Legs are long, especially ye last joint. 16

9

Scarabeus Scarabæus gloriosus splendens. The golden Dorr.



Taken flying in Greenwich Town, in the End of May: It is of ye May bug or Dorr kind; It shines like greenish Gold all over the upper side, & copper on ye under side of ye Tail part. The Head is small & squarish, ye Thorax pritty large, ye plate shaped almost like a Heart, from ye hinder part of which in the middle, a Triangular plate goes down between the Vaginæ, The Vaginæ are marked as in ye figure, with whitish or straw colour, The Tail extends beyond ye Ends of the Vaginæ, & hangs down towards ye End, it hath two spots of ye same straw colour; The Under part of the Thorax shines also, & is between green & copper colour, & is thick set with brown short hairs; The skirts of ye Tail is hairy, & so disposed as to imitate those white marks in ye common brown one. The two first Joints of all ye Leggs are hairy, & large, with several points or prickles on them; the last joynts are small & weake as in ye brown one aforesaid.

10.

Scarabeus minor ovalis, aureus, splendens, tarsipes, vaginis punctatis.

Taken in ye beginning of July upon ye Side of the water Tub in ye Garden: It is an oblong Lady bird, The head is small, & hangs downward, Shining green; The Thorax plate shines more gold like, & the Vagina between green & copper colour; The back rises round & gibbous; The Vagina by a Small assistance, from a Glass appear pitted full of small holes, the horns are pretty long, & by ye Same help of a Glass appear Joynted. The True wings under the Vagina, are of a fine red, except the Ends w^ch are transparent, The whole under Side of ye Animal is black, it goes Slowly.

11.

Scarabeus parvus chalybei coloris & splendoris, alis cæruleo tinctis.

Taken 9th July by the River Side. The whole upper Side shines blue like Steel, & under part is black, the horns grow thicker towards y^e End: the Back rises round it being of y^e Lady bird kind, The true wings look black, with Rainbow colours in them as they are differently objected to y^e Light: each hath a small black speck on y^e outward Edge

12

Idem corpore oblongo, ex uhroque Splendens, cornubus & iam longioribus

Taken with y^e last. Both sides & every part of this Shines like Steel, only somewhat more greenish It is made longer, & the horns longer also.

13.

Scarabeus minor oblongus, vaginis nigris, cauda aculeata, gibbosus.

Taken y^e beginning of June upon the Blossoms of Panax Heracleum. When laid on a Table it leaps & jerks about very often. The head is black, which draws down as it goes along, by reason the back is raised & gibbous, the horns are small & appear jointed in a glass, the head is shortly set on to the Edge of the Neck. The Thorax plate is Orange. The Vaginæ are deep Sad or rather black, & to the Eye appear Smooth, but by y^e Aid of a Glass one sees them all over beset with innumerable small points. The whole Tail part is deep Orange, made up of 5 Rings inserted into one another Scale wise; & by y^e Glass appears thick set with down: The Tail ends in a long point like a Sting. The Breast or under part of y^e Thorax is covered by a black Shell on each Side, under which y^e Tail part comes out, The hinder Legs are set on y^e Edge of this Shell, with Strong Thighs, and are pretty long. By which it leaps so briskly: The Legs are of y^e Same colour w^th y^e Vaginæ.

14

Scarabeus medius, fusco s. corpore fulvo.

Taken 28th of July upon Currans, where it is very Comm on. The head is flattish with small black Eyes. The Horns ½ an inch long, jointed all y^e way, & bending downwards towards y^e Ends, at y^e mouth are set 4 small short Feelers, the two outer ones longest, which 2 continually tremble; The Thorax Flats is dark is Sad Oranges, the Edges of it turn up a little: The Vaginæ are dark musk colour'd, the True wings under but a little longer than their Cases; The Thighs are orange colourd, the rest of y^e Legs musk, y^e latter joints indented; Taken in Colts Lane y^e 18th The male & female are just alike but y^e male is the lesser.

15

Idem omninò fulvus

Taken at y^e same time with the last; from w^ch perhaps it differs only in Six. & colour; It is like y^e last, only all yellow Tawny, It hath a Small black Stroke on the forehead a little above, y^e eyes: At y^e mouth stands a Sharp pair of Foresps, wherewith it bites at every thing when it's held; The Horns & y^e joints of y^e Legs are blackish.

16

Idem fuscus, vaginarum extremitatibus nigris.

Taken ye 8th of July in Coitu on ye Flowers of Sonchus arvensis. There is no visible difference between ye Male & Female. There is no difference between this & the last, except that this hath no black in ye forehead; & only the Toes, & ye Ends of ye Vaginæ are black in this.

17

Scarabeus minor oblongus, obscure viridis, & remisse splendens.

Taken ye beginning of June upon ye Flowers of Pinnax Heracleum. The horns appear ~~are~~ jointed to ye naked Eye, the 2 Feelers at ye Mouth have knobs at ye Ends, & by ye help of a Glass, one sees ym composed of 3 joynts; The whole is of a dull green, a little Shining, The toes seem to be white like those of many Flyes.

18

Scarabeus minor rotundus, griseus, maculis majoribus duobus insignioribus notatus.

Taken 15 June, [25th May] on Verbascum in Coitu, The male & female are perfectly alike, It is about ye bigness of a common Lady bird, The Head is long & Slender with 2 Small antennæ, The whole is grey with exceeding little Spots, One fair round black spot is placed on ye back, & another near the Tail. These vary in their grey colour, some almost black, & some fine speckt black & white, ye females are after some time exceeding turgid at the tail part.

19

Scarabeus minor rotundus ruber, vaginis 2 maculis insignitis

Taken 8th July. It is a small Lady bird; The Thorax plate is black, wth a Small white Spot on Each Side, & an oblong one next ye Neck, & two very Small ones next ye mouth, ye Vaginæ red each marked with one black Spot, ye true wings brownish, ye under side is all black. The Thorax Plate & head appear as at (2) in ye Glass.

20.

Scarabeus Maialis minor

Taken 28th of May. It is just like ye great brown Dorre or May buggs, save that it wants the white marks on ye sides of its Tail, & is not ¼th so big, The Horns are only trifid at ye Ends, ye head & Thorax plate shine like steel, in the male more purplish, & in the Female more blue, The Vagina are brown, as in ye great sort. The male is the less & rounder bodyed, ye female bigger & flatter. This sort appear about ye End of May, when the greater sort go out, & eat ye young Leaves of Trees as they do.

21 Scarabæus minor oblongus fuscus
lineis flavis notatus

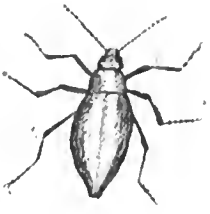
Taken 28 May. It is about ¾ of an inch long, the head large & dusky, with a bright-yellow ring between ye fore part of ye neck & ye Eyes, ye horns are about ¼ of an inch long, Orange near ye head, & growing darker to ye ends, the Vagina dusky, elegantly marked with yellow lines cross ye ... Legs dusky orange, the hinder ones very long with strong Thighs as if designed for leaping

20

22 Scarabeus aruginosus D. Petiver.

Given me in Septembr by Mr James Petiver, who took them in Coitu. The male is ye lesser. The whole except ye under part of ye Tail, & ye Legs, is of a dirty shining verdigrease colour; The Head is long & issues out from under the Thorax plate. Tortoise wise, on each side of ye middle whereof is sit a small Eye, & at ye End two horns, divided into 3 joynts each; The Vaginæ are continued down ye sides pretty deep, & to ye end of ye Tail, wch ends in a point; ye under part of ye Tail & ye Legs are black, The Thick joynt in ye Legs is eminently swelled in ye middle.

23 Scarabeus domesticus impennis



Given me by Mr Petiver, who saith That they are common in many Cellars in London; It is black all over, The Vaginæ adhere to ye body, & have no parting, they are continued down the Sides & leave about half the Tail open, wch is composed of 5 annulary portions.

24 Scarabeus minor viridis splendens.

Taken out of new dug Earth 6 Apr. 20.
The head is black, & ye Eyes, with are very small
The Thorax plate & Vaginæ shining green, the
Vaginæ striate. ye horns & Legs brown; ye whole under
part sad dark colourd.

25 Scarabeus minor obscurè grisens ventre albente.

Taken on ye ground 6 Apr. 20. The head & horns very small
ye Eyes black, ye whole upper part is very sad grey, as it
were faintly chequerd, ye under part whitish ash with an
Eye of peach in it, growing redder when dead, ye Legs black

26 Scarabeus minor unicolor, capite erectiore

Taken in a Spiders web May 3. It is all of one cloth colour, ye
Eyes small & black, ye horns a little thick at ye Ends, ye Legs pretty
long, it walks slow but with its head more raisd than common

27 Scarabeus minor, vaginis seminibus Ricini modo aliquatenus notatis.

Taken with ye last. The head & Thorax is shining black, ye Vagina shining sad towards chesnut colour with darker broad marks on ye, ye Legs horns & Eyes are very small ye whole under part sad.

28 Scarabeus minor splendens capite ranino.

Taken upon ye Ground, may 4. where it runs nimbly by starts, ye whole ~~upper~~ on both Sides is shining copper coloured, ye horns small ye head Square with prominent Eyes, ye whole looking like a Frogs head

29 Scarabeus arantii coloris, subtùs niger, cornubus cervinis.

Taken 9th May on a Gooseberry Bush; The whole upper side is deep Orange, The whole under side, Legs & horns are black. ye horns have one row of small points their whole Length.

30 Scarabeus niger vaginis striatis

Taken on ye Ground 6 May. It is somewt. like No 1. but bigger of a Shining black all over.

31. *Scarabeus viridis maculis fusco-lutesis.*

Given me by Mr Petiver. The head is bold & full, ye black Eyes prominent ye mouth-subtille-mort ye feelers & forceps green, Lines of sad part ye neck & Thorax plate, & that & ye Tail part, the wings are spotted with filemot & ye Ends tipt with ye same. The whole under part & ye Legs are changeable green blue & copper colour, ye lower part of ye Tail blue. The Eggs in a glass appear pitted as a Fly.s.

32 *Scarabeus arboreus minor dilute Viridis splendens*

Taken 15 May from an Apple Tree.
The Eyes are small & black, ye neck long, ye horns & Legs brown ye whole (otherwise) light-shining green, ye thigh eminently thick in ye middle, in one of this kind ye thighs are green & shining in another not.

33 Scarabeus minor retundus, rubr vaginis 12 maculis nigris insignitis.

Taken 18th May. It is a smaller Lady bird than the 19. The head & Thorax plate is white set with large black spots ye Vaginæ red with 12 black spots thereon, the under side black

34 Scarabæus minor gracilis, longus, fuscus cornubus longis geniculatis

Taken on ye flowers of Panax Heracleum, may 26 in Coitu. The all of one sad colour, long & slender, ye horns long & jointed. ye Legs long ye thigh thick in the middle, reddish towards the body, the Vaginæ smooth & shining, ye true wings sad at ye Ends, ye under part of the shining, greyish & divided into 6 rings. ye female biggest, & male in mounts on her back

35 Scarabeus minor remisse splendens, Scapulâ lata.

Taken on ye ground May 19th It shines all over of a faint copper above underneath black, as are ye Legs, ye Eyes very small & ye horns also. The Thorax plate is large, & square at ye setting on to ye Shoulders. The Vaginæ appear Striate by a glass

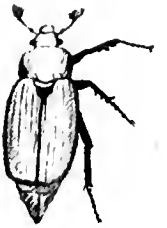
36 Idem nigrior.

Taken on ye ground about ye same time, There is LITLE difference except ye horns are thicker, & Legs browner, & ye Vaginæ more visibly Striate. I suppose this may be the male to ye Last. 23

37 Scarabeus minor fere rotundus, viridis & pulchre splendens **acetosivora**.

Taken 20 May upon Sorrel, where many are to be met in; Coitu about this time, & some of the females so big bellyed that they can scarce go. All the upper part is of a beautifull shining green, & horns wch are thickest at ye Ends, & under ye Tail black, & Legs Steel & shining. The Vagina in a glass appear curiously pitted.

38



39 Scarabeus vaginis subviridibus, apicis coccineis.

Taken 26 May upon ye flowers of Panax Heracleum . It is much of ye Shape & Size with No 17. ye upper part greenish, & somewhat Shining, ye Elds of ye Vagina are lipt with Scarlet the Tail is greenish divided by whitish rings. The Sides are Scarlet just under ye Setting on of the wings. The hue wings at ye Ends have fair Sad spots on them.

40 Scarabeus niger Londinensis Scapula lata.

Taken on ye Ground in ye Wheat in London about ye middle of May It is all over Black, The Head is small in proportion, ye horns thick at ye End, ye Thorax plate is broad & hangs over ye Sides, & every way else The Vagina are turned up at ye brims, & hang over ye Tail, & have 3 raised Strie lengthwise in each of them.

41 Scarabeus minor vaginis Testudinis . . . . . transparens & variegatus.

Taken in ye ~~Lancaster East Side~~ Gravel pits, The Head & Thorax plate Shine like Steel, ye Vagina very like Tortoise-shell, ye Tail Black & Shining ye Legs brown, & horns pretty long.

Scarabei aquatici.

1 Scarabeus minor aquatilis, fuscus compressus.

Taken in ye water in a pond about the middle of Jun. The whole is of a Sad colour, ye head not distinguishable from ye Thorax part, having two very slender horns, wch by the help of a Glass appear jointed, & by ye same aid two small black Eyes are seen on each side of ye head: The Vaginæ Shine, & are (especially near their Setting on) bent inwards with a fold to go under part of ye tail part. This contrivance seems designed to preserve the wings from being wetted when they swim. The under part is Sadder than the upper. The 4 forelegs are brown & armed with 2 Claws each at ye Toes to creep with. & issue out of ye Forepart of the Thorax together: The hinder Legs issue out of the hinder part of the Tail pretty low, & end in flat Fins to Swim with, which They do very nimbly, diving down as soon as one approaches them They will frequently lye at ye Top of ye Water basking themselves in ye Sun.

25

Pseudo-Scarabei.

1

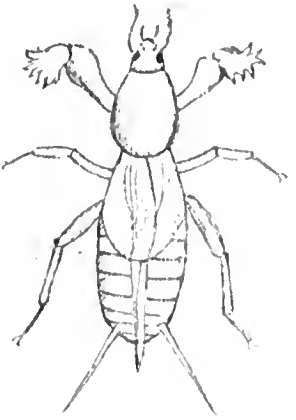
Blatta Mouffeti. p. 138
Taken about our house in London by night, where there are multitudes of them of various sizes, so that it appears they grow after exclusion, vide Swammirdam

Fœmina.

Mas.

26

Gryllotalpa.



Musca quadripennis.

1

Musca quadripennis, capite hippocampoide, cauda Scorpii. an Musca Scorpiura Mouffeti p. 62 tia. ult.

Taken 19 July on the Rasps. the head is small & chesnut coloured, on each Side of wch is a large chesnut coloured Eye, in ye forehead are 2 small yellow spots, out of wch arise 2 horns about 3/4 of an inch long, & appear jointed, like a glass; ye mouth is a long brown beak, furnished at the bottom with small Setæ; in the neck is a ring of yellow with a small yellow line behind it one Scarce discerns the Thorax from ye Tail, but from ye head it seems continued all ye way in rings with yellow Edges, at ye end of ye Tail are 3 joints like a Scorpions Tail; smooth, Shining & Brown, ye last of wch is thick & ends in a Strong forceps, this pair of ye tail turns up, & when one touches ye Insect it endeavours to pinch are therewith; The Legs are yellow long, & Slender, saddle brown, ye Feet, with 2 Stiff hairs standing at each middle joynt, they are set upon Strong thighs next to ye Thorax, the wings are large, yellow Spotted with black. Taken also in May on ye ground it could not fly

1

12

2

1. Musca apiformis, caudâ fulvâ nigro [illegible]tatâ; Taken 15 July upon Poppy flowers [illegible] my Brothers Garden at Hackney [illegible]

[illegible] of [illegible] that it hath but two wings, [illegible] a Fly without long horns, indifferently large, the large [illegible] chesnut [illegible], the nose is furnisht with 2 [illegible] black horns [illegible] large, downy & [illegible] colour'd, The Thorax & Taile are cover'd [illegible] & under with fine brown hairs, ye back of ye Thorax is blackish & a little [illegible], ye taile is marked as in ye figure, [illegible] is black, is orange where that is white, [illegible] of ye [illegible] 2. [illegible] black, ye a white small line between [illegible] [illegible] ye body is white [illegible] spot in ye midle, ye legs are black, except [illegible] wings are somewhat brownish.

2 Musca apiformis caudâ fulva

nigro notatâ altera pulchre annulatâ.
Taken 16 may [illegible] ye last from wch it differs only in these particulars, ye Tail in ye Cross mark varies a little in ye form & the 3 last annulary portions of ye Tail are finely edged with white; Under ye Tail, this is orange where ye [illegible] is white [illegible] wings have a little spot on ye outward edge

3 Musca apiformis 3a caudâ totâ

annulis albis distincta. This differs from ye first but [illegible] ye Tail hath no Orange, but is marked only with 3 white rings both above & underneath; Taken with ye last.

4 Musca [illegible] elegantes

annulata. Taken ye middle of July up[on] ye leaves of Caryophyllata. The Eyes meet, are Chesnut [illegible] horns black, ye mouth [illegible], ye back of ye Thorax [illegible] [illegible] black & its rings [illegible] [illegible] is thin & macilent, [illegible] wings [illegible] [illegible] outward edges, [illegible] black, [illegible]

32

[illegible] melanura [illegible]

[illegible] black [illegible] white.

6 Musca melanura [illegible] vivipara [illegible] greater [illegible] Fly. The Eyes [illegible] colour [illegible] not, ye horns are black pretty large, between ye Eyes & [illegible] is [illegible], the [illegible] black [illegible] stripes, ye tail appears chequered of [illegible], ye legs are [illegible] hairy, long & black, [illegible] This will sometimes when taken let fall small white worms out of ye anus, ye wings [illegible] upon them.

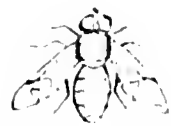
7 Musca fusca media alis pulchre splendentibus.

Taken 22 July upon Currans, ye head is pretty large, ye [illegible] Eyes meet, over ye small black horns is a shining spot, ye mouth shines also, ye Thorax is [illegible] & shines [illegible], ye tail is sad, underneath black & shining ye legs are black. the wings [illegible] over one another a little, & shine vividly, ye inner parts ~~the~~ green, & ye outward Copper.

8 Musca fusca cauda subtus canaliculata taken 22 July upon ye [illegible] Americ. Park, a black [illegible] parts, [illegible] Eyes, under ye small black horns is [illegible] the Thorax is [illegible] stript next the head, ye tail is [illegible] made or [illegible]

[illegible] legs, underneath black, wth a furrow running lengthways [illegible] row at ye tip, & broader towards ye body, ye legs are [illegible] black wth white Toes, ye wings saddish transparent, & longer than ye Tail.

9 Musca apiformis fusco-fulva major.



Taken at ye beginning of September upon ye Flowers [illegible] Fennel resembles a bee in its looks, colour, [illegible] & feeding on Flowers, but wants the 4 wings, & [illegible] take to be Characteristick notes of a Bee. It is [illegible] fly, of a dark [illegible], set with fine brown hairs, ye eyes are [illegible] [illegible] in a [illegible] as in ye Common Fly, divided [illegible] of ye head by a black shining Knob. Two small black [illegible] come out of another black knob, each set wth one fine [illegible] ye Face is thick set wth small brown hairs, & ends [illegible] in a [illegible] longish beak wherein lyes ye proboscis, [illegible] is very hairy on all sides ye Tail [illegible] do, [illegible] when ye fly alights it heaves up & down [illegible] its respiration; it is somewhat compress'd [illegible] upon pressing ye [illegible] I could not discern any [illegible] [illegible] are [illegible] on ye edges hairy [illegible] ye [illegible] legs whitish ye hinder legs [illegible] [illegible] ye middle portion [illegible] & flat [illegible] The 2 wings are long & large very transparent, [illegible] [illegible] a [illegible] or brown. ye [illegible] disposed unusually, ye wings lye a little over one another not as in ye [illegible].

10. [illegible]usca Splendens cauda compressa, alis ex fulvo [illegible].

Taken [illegible] ye middle of June upon ye flowers of Podagraria [illegible] is wholly taken up by the Eyes, which meet together [illegible]nish, & appear pearled in a glass; Two small horns come [illegible], under which is a Small black Shining spot. The Thorax shines and is a vivid green, & by ye help of a glass appears full of brown hairs; The Tail shines also & is of a brown green, appearing to be full of brown down in the glass: it spreads broad towards ye End, & comes off round, & is made up of 5 Rings; underneath it is flattish, & ye Edges round turn downwards, & ye Glass shews it to be finely punctate; The Legs are sad brown, The wings are longer than ye Tail, & brownish all over.

11. [illegible]usca longa-gracilis, 3 Striis nigris in [illegible]orso notata, alis fusco-fulvis.

Taken 19th May on ye Flowers of ~~pana~~ panax Heracleum [illegible] of ym sit together thrusting down their long proboscis into ye hollow of ye Flowers. The head is round & small [illegible] not easily discernable, being of ye same sad colour with ye rest of ye head, 2 small stiff horns come from one original [illegible] part of it. ye body is ash on ye back are 3 fair black stripes, ye Tail & Legs sad & hairy, ye wings long & brown, [illegible] common to all flyes are small [illegible] [illegible].

Musca media fusca, caudâ 4 maculis [illegible] notatâ.

Taken 19th May upon ye Flowers of Panax Heracleum; Its Eyes meet & are sad, ye nose Silverish, wth 2 small hairy horns thereat, ye body is dark grey, ye Tail Lighter wth 4 fair black spots thereon, very hairy, & underneath parted lengthwise with a broad black line, ye membranes under ye wings are whitish.

13 Taken 25th May on Apricock Leaves. The Head & back is sad, ye Eyes large almost meeting. The upper side of ye Sharp pointed Tail black & shining, divided into 4 rings by white Circles, ye belly yellow, at ye End black, The 4 leggs before Yellowish, ye hinder ones sad, with a brown spot in the midst of ye 2 upper joints. The division between the 2 Eyes white.

13

14 Musca apiformis velox luteo et nigro varius.
[illegible]

Taken 1st June in ye Lane near [illegible] Field. It is a very [illegible] Fly. The head is large, ye Sad shining Eyes meet atop, between them in the fore part of ye face are 2 large long yellow spots parted by a black line ye 2 horns black, thick & indifferently long, ye thorax is black, two small [illegible] run down ye length of it in the midst, [illegible] yellow spots [illegible] [illegible] black [illegible]
[illegible]
[illegible] up to ye under part of ye Tail [illegible]

15.

15 Musca pavonina gracilis splendens.

Taken y^e beginning of June & 17 July on Rasps & Currans bushes. It shines green all over, the Eyes especially, w^ch have ... which is a white spot & just above that, come out 2 little horns standing out two ways, the wings are long & large brown at y^e ... end, & white at y^e very end; The Legs are brown towards y^e End ... & pretty long.

16 Musca media tota viridis splendens.

Taken y^e first of June on y^e Hedges in y^e Lane near East ... where were many of them, It is all over green, a ... shone ... y^e Eyes, y^e horns are black & end in a fine hair ... thighs are brown y^e rest of y^e Legs black.

17 Musca fusca Nasicornis.

Taken w^th y^e Cast, The Eyes are reddish brown, parted on the top with a pretty black division, a Streight brown shining horn goes streight out at y^e Nose under w^ch ... a Streight black thickish tongue, y^e true horns are brown, The Thorax is sad, with 3 black stripes thereon, y^e appendent knob to y^e thorax, between y^e setting on of y^e wings sad chesnut colour, the tail is chesnut, the Edges of the Rings ..., & divided length wise by a black stroke, y^e tail is almost circular, flat, & sharp at y^e ... edges, underneath brown in y^e middle, & blackish at y^e edges, the Legs are ... sad, the wings are greenish.

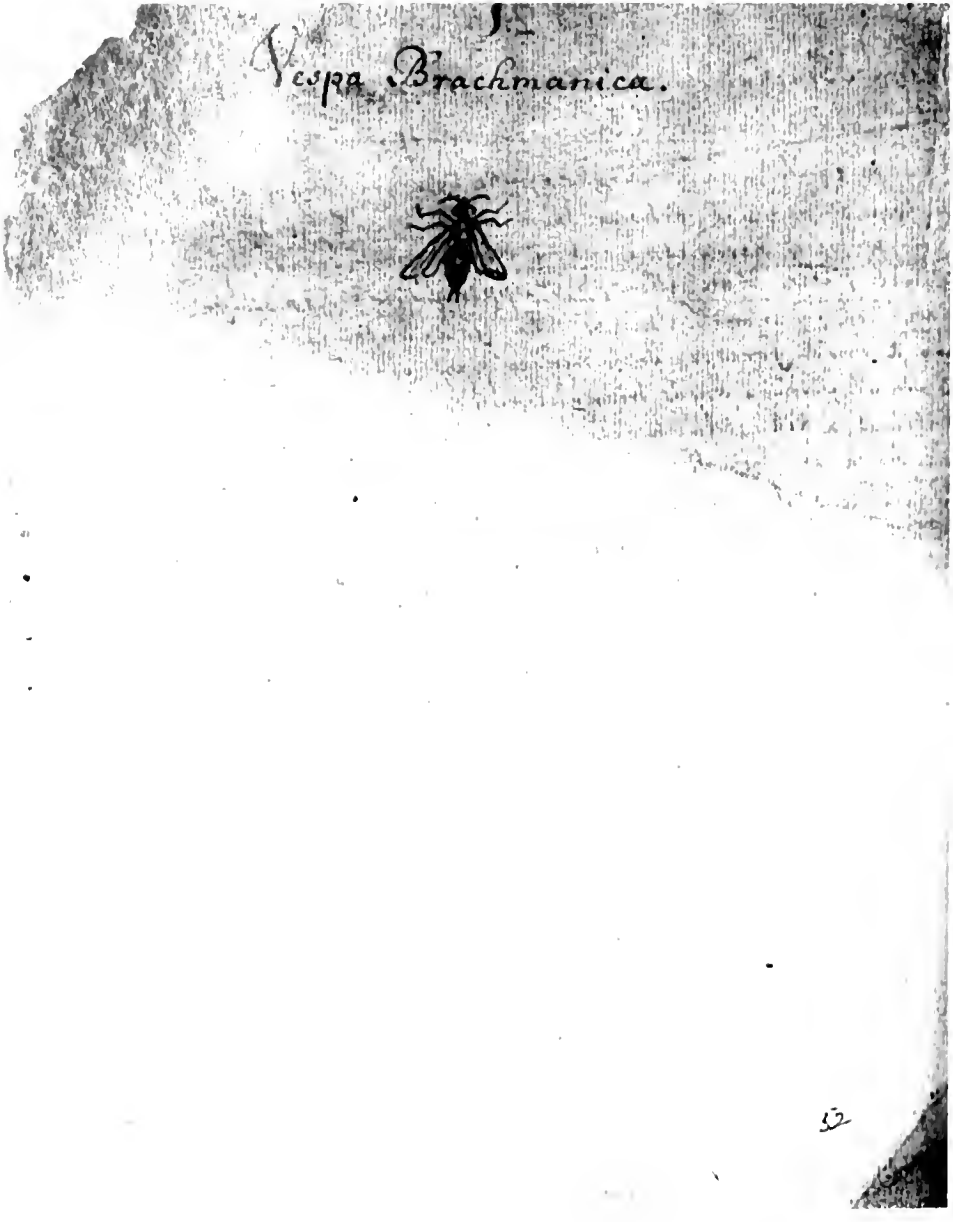
Genus vespinum. The Wasp kind.

I reduce those Insects of my own observation to this kind, that have 4 wings, & whose Tails or hinder part of the body is joyned to y^e breast or chest, by a small thread, as Mouffet speaks: page 42. Corpus Vesparum medio pectori tenuissimo quodam filo alligatur; whether they have Stings or not,

1

Vespa minor duobus aculeis, annulis in cauda flavis, maculâ insigni flavâ in fronte notatâ.
Vespa Brachmanica nobis. The Bramin Wasp.

Taken ye beginning of June; The Head is large & black, as also are ye Eyes, wch are black, the Horns come out of ye Forehead, arising from two Originals, & seen in a Glass appear joynted & grow bigger & bigger from ye head to ye Ends, ye Mouth is furnished with a Serrate Forceps, ye part of wch in Shutting goes over the other, is open Sideways, & bites very hard; just above the mouth & between ye lower part of the Eyes, is a fair yellow Spot rising above the Surface like a Studd. The Thorax or body is black; & that & the Tail is covered with a hard Skull, the Tail is composed of 7 or 8 Rings of yellow upon black, wch go over one another when it Shrinks in its Tail, as the plates do in Armour; The Tail is fixt to the Body by a very Slender juncture, as in this Kind is common. The Legs are yellow & indifferently long. It hath 4 Wings, long & Slender, the inner ones not above ½ the length of the outer ones. With much irritating at length it thrust out 2 Shines set at some little distance from each other, several times. I call it by this Name from ye Bramins Customs of making a yellow Spot in the foreheads of their Votaryes.


Vespa Brachmanica.

2

Vespa [illegible] altera, ore auro micans
The Gold'n mouth'd [illegible] Wasp.

Taken 19 [illegible] on ye currans, The Eyes are larger than
ye former & black, between them are 2 small lines of
yellow, where ye horns come out, ye bottom parts stands up
against ye Face & are yellow, & ye upper parts bends off & are
black; ye mouth shines like gold, under wch plate
is a small forceps; In ye hinder part of the head stand
3 small shining knobs triangular-wise, Scarce vi[illegible]
without a little Assistance from a Glass. The [illegible]
all black on both sides except 4 yellow spots next ye [illegible]
The Tail is slenderly set on made of 6 yellow rings set upon
black, wch appear but obscurely underneath, The thighs are
black, ye rest of the legs yellow, except ye toes, wch are
dark, the 4 wings are [illegible] transparent, & have a shew
of rainbow colours on them

2.

3.

Vespa minor tota nigra. The small Black wasp.

Taken 19 July, It is all black, except a Small Silvr plat at ye mouth; & ye wings, wch have a Saddlish tincture on ym, the inner ones are much less yn ye outr ones.

3.

4

Something Bigger ye the life.

4. Vespa longa, pectore & dorso nigris, caudâ & dorso ventrâ alba notatis, cornibus tremulis in medio albis.

Taken in ye beginning of June on ye flowers of Tithymalus segitanus lunato fl. Moris. The head, Eyes, & Thorax are black, except one wte Spot between ye Setting on of ye wings, on ye back. The Horns are more yn ½ an inch long, curled at ye Ends, & black except a portion of wte in ye middle, trembling incessantly when it goes; The Tail hangs on by a Slender thread, the first ring black, ye 2 nxt Orange, ye remainder black, wth a white spot at ye End; when first taken, by thrusting the Tail towards the Head, came out a black point or Sting from ye middle of ye under part of ye Tail; The under part of the body is colourd like ye uppr, but ye Tail is flatter, with a ridge in ye most of ye rings running length ways; The Legs are long, ye first joints black, then softer orange, then black, then green to ye toes. Vide No 7

5

Vespa longa pectore & dorso nigris, minor absque scutis albis. Taken on ye same flowers & at the same time with the last. The head Horns & Thorax are black the Tail long, & slenderer than ye last, made of 7 rings of wch ye First is black, the 3 middle ones Orange, & ye 3 at ye end black, the liggs are browner than the former, it hath not the Spot on ye back & Tail, & the Horns curle not so. The figure is a little bigger than ye life & the Tail too thick.

5

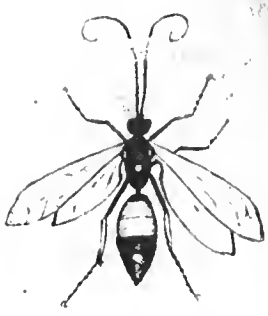
6.

6 Vespa nigra minor gracilis, caudâ in 2 setis aculeum inservientibus desinente, cornubus prælongis tremulis Taken wth ye last: It is all black, save ye orange thighs: when it goes ye Horns tremble exceeding fast, feeling what is in ye way; The outward edge of ye bigger wings hath a small Spot on it, a long sting or point comes out under the tail about ye midst, wch when ye Tail lyes streight remains between ye 2 Setæ in wch the Tail ends, wch seem a guard to it, & when ye Insect pushes wth it, in bends ye Tail downward & towards ye head, & thrusts the said sting strongly towards ye head, as that No 4 also doth.

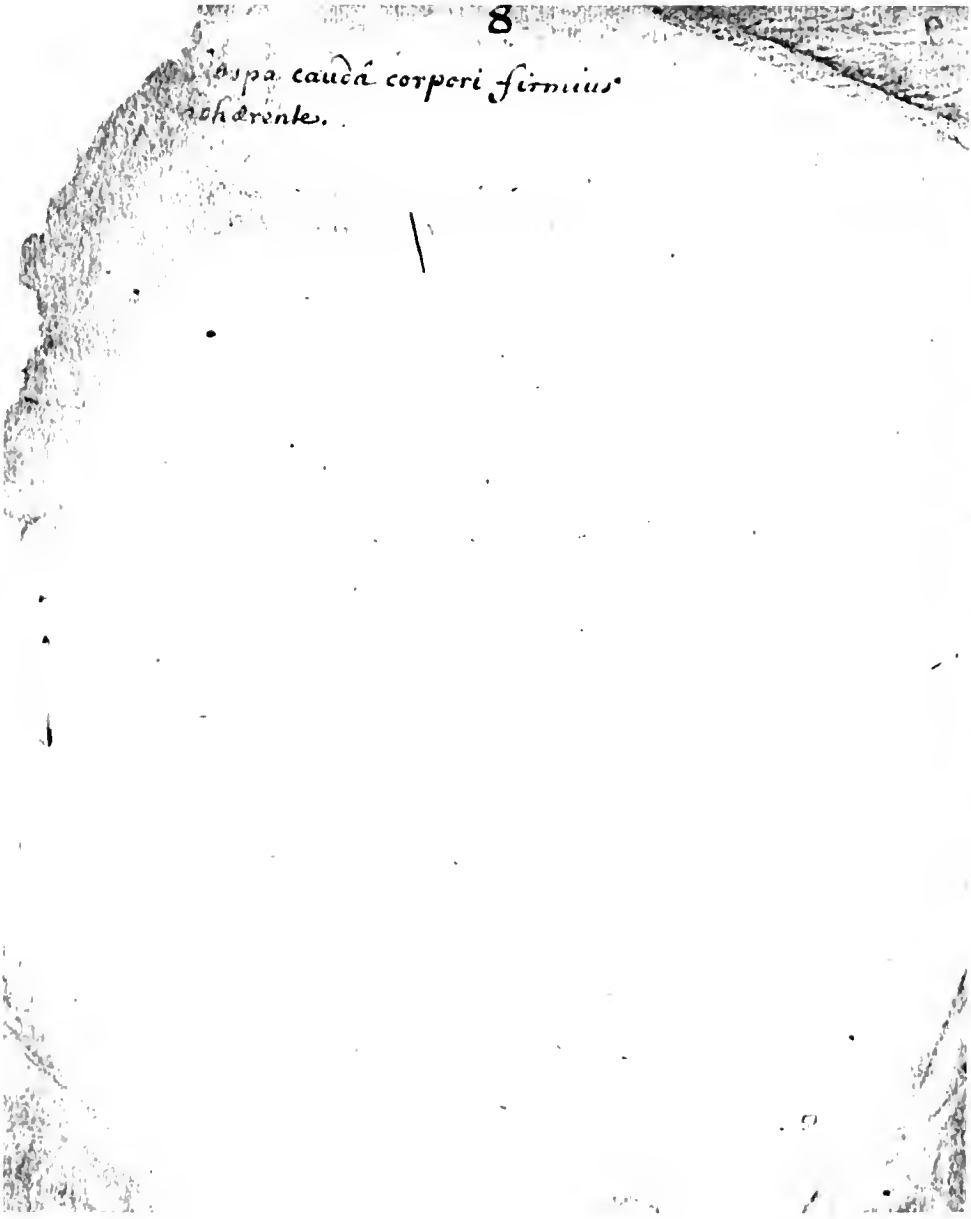
54

7

Vespa oblonga maxima pectore & dorso nigris, cauda 4 & dorso tribus albis maculis notatis, cornubus tremulis, in medio albo notatis



Taken 14 September. It is very like the 4 but 3 or 4 times as bigg, & besides y^e^ Spot which that hath in y^e^ middle of y^e^ back, this hath one at y^e^ setting on of each of y^e^ bigger wings; y^e^ white Spot at y^e^ end of y^e^ Tail is here distinguish into 4, one on each of y^e^ 4 last rings. in y^e^ other y^e^ Tail is flatter, in this very turgid, opening on each side, which appears here or stirr is supplyed by a thin yellow Skin, in all other things this is like y^e^.


8
Aspa caudâ corpori firmius
cohærente.

9 Vespa nigricans graculis Nº 6 similis sed
major, cauda absq; setis.

Taken 25th May on ye Flowers of Panax Hera-
zelsum, It is every way like Nº 6 but bigger, & hath not the
sting, or else with that hath; perhaps it is ye female to that.

10

10. Eadem fronte flava.

Taken in ye Lane by East Field. June 1st. This differs in nothing from ye last
but in ye Square yellow Spot it hath between ye Eyes, & ye finely jointed horns
are yellowish before, & black behind.

Apinum Genus.

Bombylius Dni Purchas. Viviparus.

[H]e describes it p. 188, & gives
[a]n Anatomical account of it,
& also of its being viviparous p. 191.
Purchas's Theater of political flying
Insects. Anno 1657. In ye figure
ye first white ring is yellow in ye Bee
ye wte rings in ye midst of the Tail is yellow also, & the end white.
The figure is a little too big. I took one of this sort May 10th three
times as big.

1.

2 Apis fusca caudâ glabrâ.

Taken upon Poppy flowers 17th July. It is all of a dark sad
colour, ye face & back, thick set with fine Brownish hairs, the
horns short & streight, ye Tail smooth & Shining, under wch was
much yellow matter like Bee bread, ye wings brownish, wth a deeper
brown stroke on ye outward Edge of each of ye bigger wings near
the end, ye Legs middling; Just at ye setting on ye wings, on each
side is a remarkable small round black shining Knot.

3 Apis minor fulva alis prælongis, Brevis modo sp. [illegible]

[illegible] taken [illegible] [illegible] dead.
[illegible] ... of ye back is black,
[illegible] ... also
[illegible] ... speck with black

[illegible]
[illegible] upper ... with a black
[illegible] shine ... with Rainbow colours.

4 Apis gloriosa

taken on Cherry [illegible] May 24 The whole forepart is of a beautifull
bluish green; & ye Tail especially ye upper part shining copper, on
the sides changeable into yellow and green, [illegible]
when [illegible] it puts forth a long flexible thing. the wings [illegible]

Genus Cimicinum.

1.

Cimex subviridis variegatus, odorem gravem spirans.

Taken in the beginning of June; It moves slowly, when it stands still the head is raised like y^t^ of a Frog. If it be laid on its back, it can hardly recover its feet, which after much Struggling it does by turning over its head. It smells very Strong, & very ill; & when dead turns all black, & shrinks up to meer Skin. The head is like a Tortoises; y^e^ two small Eyes are black; y^e^ horns have three Joints, white at y^e^ Junctures, elsewhere blackish; The Thorax & Tail greenish; it hath neither Wings nor Vaginæ. Round y^e^ Skirt of y^e^ Tail part on both Sides it is marked with little V's. The middle is regularly mark'd w^th^ Spots the 4 largest & middlemost are copper colour'd & in Bas-relievo, y^e^ others black & not raised. the belly is green with a black line running cross its length. The Legs are greenish also, but blackish at y^e^ Ends.

Taken at [illegible] Wells 1695

Bombylius niger, cauda in [illegible] aurantii coloris desinente

Taken among ye Corn upon ye Flowers of Panax Coloni, Aug. 3. The figure is too long; it is all over black except the 3 last Rings of ye tail, wch are Orange, being thick set with hairs of ye colour, [illegible] above, & more [illegible] underneath; A shining black small knob on each side of ye Thorax at ye setting on of ye wings, ye legs are strong & hairy

19

2 Phalæna splendens ex aureo-fulva

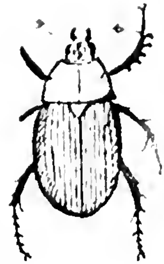
Taken flying in ye day 5 August, It is all of one light-brown
colour shining as if varnisht with a dilute gold colour;
The Eyes are round, prominent & very black, ye horns short
& slender; It hath a particular way of flying, ye wings
moving glittering, & by turns quicker & slower.

3 Papilio alba, alis macu:
:latis corpore nigro. Taken 12th Aug.
flying, ye middle of ye Thorax black, as
is ye upper part of ye tail, ye Eyes very
black & prominent, round ye horns, about
ye head, is set with white hair, ye under part of ye [illegible] ye legs covered
with a mealy whiteness, ye horns black tipt at ye ends with white, ye
wings on ye upper sides white with black as in ye figure, ye ribs
of ye wings blackish, ye under wings on ye under side brimstone
ye ribs there [illegible], ye under side of ye upper wings white
except ye ends wch are also brimstone coloured.

Papilio minor alis ex [illegible] fuscis, macula nigra in medio alba insignitis.

Taken 1st Aug. [illegible] ye Common, ye upper wings are [illegible] for ye most parts, except round ye Edges & in ye [illegible] where they are sad, ye under wings are only orange in ye middle, & underneath all sad, straiter towards ye setting on, & ye lower ½ lighter; ye upper wings have each towards ye End, a fair black spot wth a small white spot in ye midst of it, ye main body [illegible] very sad, ye horns have not a knob set on ye [illegible] near ye End grow thicker only.

5 Scarabeus major terrestris ater splendens vaginis striatis



Taken on ye Common 13th August creeping in ye paths. There are 2 sorts, a less wch I take to be ye female, ye under part of wch is purple shining as steel, ye bigger shining green, wch I suppose to be ye male, ye first pair of legs is set on ye Thorax, ye second on ye part of ye tail next ye thorax, & ye 3d pair in ye midst of ye tail, wth strong thighs.

[illegible] Notes [illegible] 1692 & 1695

Sec under A — 1. Musca corpore & [illegible] caudâ in longum acuminatâ, [illegible] capite parvo [illegible] [illegible] pilosis [illegible] [illegible] taken [illegible] 28 [illegible] on ye [illegible]

2 Eruca parva viridis [illegible] Geometr. this is that wch eats up ye [illegible] leaves, it hath 3 pair of feet before, & one pair behind, besides two holders at ye taile, by which it will stand erect & reach out its whole body to lay hold on what is in its reach, ye head is almost transparent, [illegible] small whitish [illegible] runs along ye length of ye back; taken [illegible] ye [illegible] [illegible] May [illegible]

3 Eruca viridis major [illegible] [illegible] &c. taken of ye [illegible] [illegible] common, its head is green, hath 3 pair of feet before, 4 pair in ye middle & ye 2 holders at ye taile, on each side just above ye insertion of ye feet runs a pale pretty broad yellow stripe the whole length of ye body, along ye upper part of this yellow stripe runs a fine line of white & on ye top of ye white a broader line of Cinamon colour, with white spots in it, wch spots stand one in ye midst of each ring; On each side of ye back runs one other small pale yellow stripe ye length of its body, in the middle of ye back at ye insertion of one ring into another is a small spot of Cinamon colour [illegible] [illegible] in all these rings towards ye head & taile [illegible] when it creeps the body seems to move within ye skins before ye [illegible] rings are inserted almost [illegible], when [illegible] it [illegible] falls on one side & [illegible] [illegible] by way of security [illegible] it with [illegible] [illegible]

3 Eruca major fusca caudâ protuberante, found under ye Coping of a brick wall, it seemed near its change [illegible]

4 Scarabæus medius fuscus saltans. ~~[illegible]~~ when taken it counterfeits its self dead, & when turned on its back it will leap up, by a spring in the neck, Mr [illegible] calls it ye Castanet Fly, from ye snap it makes, wn it springs.

1. Adde to No 1. ye taile is bifurcate if narrowly viewed, it hath 3 black stripes on the back, ye outward edges of ye wings near ye insertion are brown, ye legs & back are furnished with small fine hairs, ye back is gibbous, ye head hangs lower yn it, ye Eyes are large & rather more chesnut col than ye rest of ye head.

42

5 Musca flava corpore producto, capite & dorso nigro, bicorni. taken 5 or 6 June, ye colour is a vivid orange yellow, ye 4 wings are of ye same colour only towards ye Ends more transparent & ye outward Edges of them black almost to ye End, ye 2 under wings are not black at all, ye leggs are yellow too, only ye lower parts spotted black, ye 2 horns arise not out of ye same origine as in some others, 2 small yellow threds hang from ye mouth ye horns stand as in Goats, ye very point of ye Taile is black, It is but a dull fly, or Bee rather.

6 Scarabeus minor rotundus griseus maculâ nigrâ in dorso & altera in Caudâ notatus, proboscidi producto antennis [illegible], it is grey with exceeding little Spots, on ye back a fair round black Spot appears, & another near ye Tail, it is about ye bigness of a common Lady Cow, & they were in Coitu, the Male & Female are perfectly alike.

7 Eruca elegantissima, flavis & nigris maculis notata, iucunda. The ground of their body is a pale ~~[illegible]~~ blewish white, the body is composed of 12 or 13 rings, on ye top of the back, & in ye middle of each ring is a large yellow spot, upon wch yellow Spot are 4 small black spots set in a Square on each side of ye body along its length are smaller yellow spots one on each ring, upon & about wch are many bla spots of several figures & bignesses, ye head is black yellow spotted wth very small black spots, it hath 3 pair of Feet before, 4 pair [illegible] middle & ye 2 holders at ye tail, it feeds upon ye Leaves of Verbascum, I found many of them about ye End of June but not on any other plant, when touched it springs & jerks like a fish newly out of ye water, & throws it body round securing its head with its tail, it is a little hairy, ye hairs are long but thin set.

8 Eruca striata quasi oculata, about 1½ inch when at biggest somewhat hairy, ye head is blewish with 2 black spots seated in ye place of Eyes, a white line runs ye length of it just in ye midst of ye back, on each side are slender stripes of orange blew & sad, ye blew ye broadest, ye rings of ye body are longer & flatter, it hath 3 legs before 4 in ye midst & 2 holders, I fed it with

Apricock leaves, & after 10 days i.e. ye middle of June it spun a long fine white silk web. see a fly ——

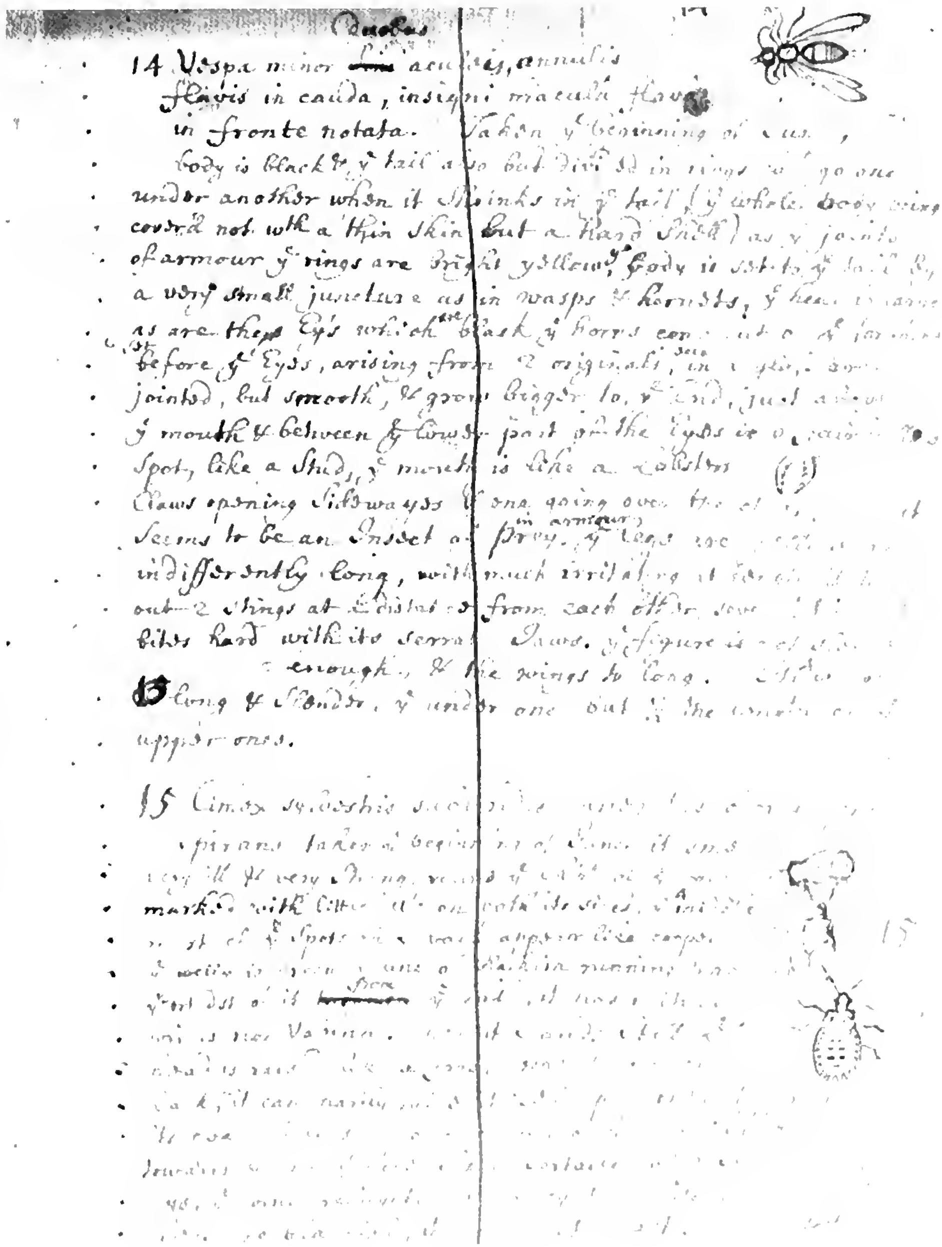
9 Musca sanguisuga, ye Horse fly, ye Eyes are very like an Opal in ye fine changeableness of its colours, ye head very wide, extending on each side beyond ye Shoulders, ye wings grey, ye proboscis blunt & flat at ye end as a Leeche's mouth.

10 Musca minima viridis, saltans alis praelongis, this is ye production yt appears upon ye backsides of leaves & stalks in Clusters like Lice, it hath 2 very small black Eyes, 2 long horns & 4 wings, ye 2 outermost are as long again as ye body, & ye 2 innermost much less, it flies hovering in the Evening, & when it lights if touched skips as a Grashopper a great Length, probably it is necessary it should be thus furnished to throw it self into ye Air when it is about to fly ye length of ye wings hindering its more immediate flight from ye Place where it stands.

11 Phalaena media ex albo & nigro varia, alis utrinque eodem more notatis, ye head & Shoulders are yellow with black spots, ye Eyes black, ye rings of ye tail end in a yellow Circle going round it, ye legs are brownish & ash coloured shining, ye antennae more than ½ inch long, ye wings are faintly marked with black or near it, ye ground white, all four wings are nearly alike.

12 Phalaena tota alba plumata, ye body is slender about ½ inch long, ye legs very long & branched, ye wings each are composed of 2 perfect feathers joyned together near their Origine, ye eyes very small & black, ye antennae about ½ of an inch long.

13 Phalaena fulva


Dubois

14 Vespa minor aculeis, annulis flavis in cauda, insigni macula flava in fronte notata. Taken ye beginning of [illegible] body is black & ye tail also but divided in rings wch go one under another when it shrinks in ye tail (ye whole body being covered not wth a thin skin but a hard shell) as ye joints of armour ye rings are bright yellow ye body is set to ye tail by a very small juncture as in wasps & hornets, ye head is large as are they Eys which are black ye horns [illegible] before ye Eys, arising from 2 originals, [illegible] jointed, but smooth, & grow bigger to ye end, just above ye mouth & between ye lower part of the Eys is a [illegible] Spot, like a Shield, ye mouth is like a [illegible] Claws opening sideways & one going over the other, it seems to be an Insect of Prey in armour, ye legs are [illegible] indifferently long, with much irritating it [illegible] out 2 stings at a distance from each other [illegible] bites hard with its serrated Jaws, ye figure is not [illegible] enough, & the wings to long. [illegible] long & slender, ye under one but [illegible] the [illegible] upper ones.

15 Cimex sylvestris [illegible] spirans taken ye beginning of June it [illegible] very ill & very strong [illegible] marked with little [illegible]

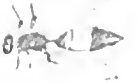
17

18

18. 4 [illegible]

19 [illegible]

20 [illegible]



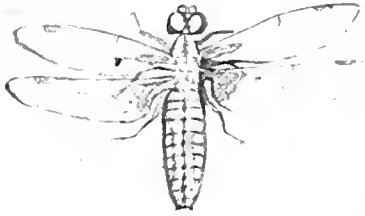
21

22

23

26

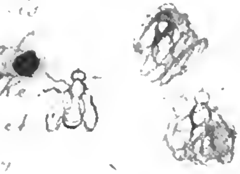
28



34. [illegible] pede [illegible] & dorso [illegible] maculis.
[illegible] ye same [illegible] make [illegible] fine, like [illegible] is [illegible] ye [illegible] white [illegible] horns, [illegible] perhaps [illegible] the [illegible] in many [illegible] ets.

35 [illegible] ——, [illegible] vaken [illegible] on ye [illegible] Thymares; It is [illegible] kinds wch are Orange, when it [illegible] it [illegible] are [illegible] trembling exceeding [illegible] of [illegible] the big [illegible] kind of thing comes out from near ye [illegible] tail underneath, wch when the taile [illegible] ye [illegible] with the taile [illegible] to it, [illegible] with it, it turns its tail inwards, [illegible] very Strongly, as one may feel with a pin. [illegible] 20.

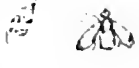
36 [illegible] Vespoides, capite nigro [illegible] ore albo, cornuorum [illegible] extremitatibus albis.
[illegible] ye beginning of June [illegible] the Rasp [illegible]. [illegible] is larger, & A [illegible], & whole [illegible] horns, which are white [illegible] white Spots on each side under ye wings at [illegible] of ye taile [illegible] chest, this moves as [illegible] with its horns tho' not so quick, [illegible] the [illegible] is [illegible] on to ye taile [illegible] Strongly, & not by so slender a thread [illegible]

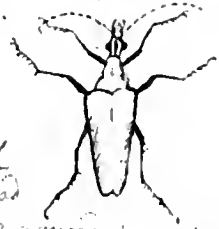


37 Musca Splendens [illegible] compressa [illegible]
ex fulvo fuscis. [illegible] in y^e midst of
June upon y^e flowers of Podagra[illegible]. The
head is [illegible], taken up by the Eyes w^{ch} meet
together, & shine greenish, & appear [illegible]
pitted in a glass. 2 small horns come out [illegible]
a small [illegible] shining spot, y^e body [illegible]
in a glass appears full of brown hairs, [illegible]
green Shining, appearing to be full of brown [illegible]
glass, it spreads broad towards [illegible]
y^e rings, underneath tis flattish, [illegible]
& in a glass looks finely punktated, y^e legs are sad [illegible]
wings are longer y^n y^e tail, & brownish all over

38 Musca fulva cauda villosa, alis in
medio parva macula insignitis, Taken at
y^e same time & place. The Eyes stand [illegible]
on each side y^e head [illegible] colour, [illegible]
inside, on before y^e [illegible], in y^e middle of w^{ch} behind, [illegible]
a reddish Spot, y^e body is [illegible]
gibbous, of a sad grey [illegible] colour [illegible]
[illegible] is very thick set with fine brown long hairs [illegible]
[illegible] part of y^e body. The wings are pretty [illegible]
than the body with a small [illegible]

39 Musca oblonga, cauda et alis [illegible]
[illegible] argentea. Taken at y^e same
time & place. They Eyes taken up the [illegible]
[illegible] midst of y^m come out 2 short [illegible]
[illegible] horns arising from [illegible]
[illegible] horns are white & [illegible] colour [illegible]
[illegible]



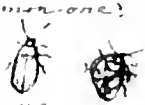


43 Phalana media grisea, [illegible]
cruciformibus notalis, [illegible] alis.
Taken at the end of June on [illegible]
clothes. The head is short & pointed [illegible]
prominent & very black [illegible]
a black stroke to the shoulders [illegible]
sitting, on & after [illegible]
[illegible] between [illegible]
[illegible] grey with Crots like marks [illegible]
with white, & Ends are Scalloped, [illegible]
& Shine like Sattin, [illegible]
under Side of ye upper wings, [illegible]
[illegible] & tail [illegible] large [illegible] hairy, blew
or ye papilio [illegible] grey [illegible]
the middle of its underbelly, thighs [illegible]
white hairs, the legs [illegible] in [illegible]

44 Apis [illegible]
variegata, inferius [illegible]
taken ye middle of June [illegible]
without horns, or other furniture but what is [illegible]
beak at ye mouth, 2 is ye upper [illegible]
[illegible]
[illegible] colour, ye upper [illegible]
[illegible]
[illegible] as in 3 [illegible]
[illegible] 4. [illegible]

45. [illegible] 10 [illegible]

2



58, [illegible] a ... [illegible]

59 Musca parva nigra Splenders ... [illegible]

... y^e Wasp kind, & shines of a ... copper colour, ... y^e End, y^e Eyes are long ... [illegible]

60 Culex cornubus plumosis ... Hook Micrographia ... where is a figure & Descr ...

61 Papilio fusca alis ... macula nigra ... insignitis, Taken y^e beginning of July on y^e Grass in y^e field, two short brush come forth between y^e Eyes, w^ch are reddish Sad, the whole head body horns & upper wings sad, & somewhat shining, y^e Under wings are orange in the middlemost parts Shaded & Clouded w^th sad, at y^e corners Stands a ... black Spot ... a Small white Specks in it, y^e under part of y^e under wing 1. is y^e most vivid Sides, as is the under part of the upper wings, finely parted ... wavy w^th a lighter colour near y^e ...

62. Scarabeus ex minimis ex fusco auratus, found y^e beginning of July, a Small ... [illegible]

63. ... Moufett p.160 ... [illegible]

4?

64 [illegible] 

65 [illegible] 

66 [illegible] 

67 [illegible] 

68 *Phalena media* [illegible]
night by a Candle July 8. [illegible]
a Straw colour, y^e Eyes black, y^e upper [illegible]
have a faint reddish undulated lines on [illegible]
under wings are as long & near as large as y^e
upper, the Legs are pretty large Strong & brown.
as I stuck it down it laid many very small [illegible]
the tail is darker colour'd especially towards y^e [illegible]
wings hanging down. in 2 or 3 houres the Eggs [illegible]

69 *Phalena alis ex fusco viridescentibus*
maculis nigris insignitis. taken [illegible]
in y^e same manner, the head is [illegible] ending in
a longish proboscis, y^e Eyes [illegible] y^e horns pretty
long, [illegible] standing at right angles [illegible]
y^e head y^e upper wings are [illegible] towards y^e upper
w^ch [illegible] running toward y^e End not coloured but [illegible]
a black Spot y^e ends fringed brown, y^e middle pa[illegible]
purplish Sad, on y^e upper part of w^ch are 2 [illegible]
are Branches, y^e under wings ash Shining, the [illegible]
was stuck with a pin it laid many [illegible]
by thrusting out a long tube a good way from [illegible]
wrigled about & one might see y^e Egg come through it [illegible]
place where it was laid, [illegible] it pull'd in & put [illegible]
an [illegible]

70 *Scarabeus* [illegible] *vaginarum*
extremitatibus nigris, [illegible] 8 July in [illegible]
[illegible] y^e flowers of *Lysimachium*, It agrees exactly [illegible]
N^o 23, except y^t in this y^e [illegible] are only black [illegible]
& it hath no black on y^e forehead.

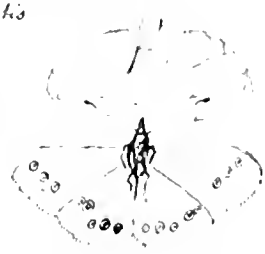
71 [illegible]
[illegible]
[illegible]
[illegible]
[illegible]

72 [illegible]
[illegible]
[illegible]
[illegible] yellowcast with [illegible]
[illegible] w^ch objected to y^e light shine [illegible]

73 

74 

75 

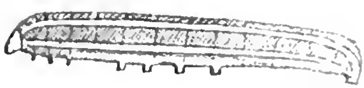


77 

78 Musca bipennis citricin, an
an 3a Moufeti p. 63. Taken 22th
July floating on ye water, from whence
I suppose it was newly emerged being
produced as I guess in the water. ye whole
is greenish Orange, except ye end of ye tail which is [illegible]
the Eyes are small & black standing on each side of ye [illegible]
before wch are 2 very small fine horns, the [illegible] is pret[illegible]
thick, paler on ye sides, as is also between ye [illegible]
the end of wch grows thicker, & at ye extremity [illegible] 2
long small hairs a inch in length marked with [illegible]
white, scarce visible without a glass, [illegible] colour [illegible]
under part of ye body is brown; the legs are [illegible]
in ye fore part of ye Chest under ye head come 2 sma[ll] [illegible]
[illegible] were legs broken off. The wings are very [illegible]
[illegible] greenish, ye rest transparent.

79 Eruca elegans flavis striis.

Taken ye End of Aug. in a Clover field
a very sad brown broad stripe runs down ye
middle of ye back on each side of wch runs a narrow yellow stripe [illegible]
with white, & on each side another broad lighter brown stripe [illegible]
black, under that on each side a yellow stripe like the former [illegible]
part edged with white & ye under edged with grey. ye head & [illegible]
is a reddish flesh colour, ye Legs are 6 sharp [illegible] ye head 8 [illegible]
over in ye midst & ye 2 holders at ye Tail. [illegible]
[illegible] some time upon Letture it hid it self under one
of the Leaves wch it fasten'd to ye box, & [illegible] to
a very dark brown Aurelia wch in some day turned
black



6D

[illegible] Power, wisdome
[illegible] exhibite [illegible] the Immense Variety
[illegible] wherewith the Great Creator has furnished
[illegible] naturally leads us to ye admiration of
[illegible] adorable Perfections so eminently displayd
[illegible] his works, Amongst others the Vegetable
[illegible] kingdome affords instances in as vast a Variety
as the Plants are which He has made, whether
we consider their Numbers, differences, Figures
diversity of ways of vegetation & producing their
kinds, Structures, Vertues & Uses, In all which
since a regular distribution of what might be said
will be oppress. & ~~after all y~~ ~~can be said~~ difficult
to reduce to a good method, such thoughts and
Observations as occur are here set down for ye
present till they can be brought into a more just
Order.

56

1. . . The . . .
tends to . . .
& perhaps . . .

2. The flowers being of different colours . . . a great distance direct Bees, & divers other flying Insects, whether to repair for . . .

3. Perhaps Plants may serve amongst other Vses, to strain & correct some noxious Juices before they come abroad into ye Air, by their passing through their Vessells.

1. I do not remember any Tree to have down on it's seed, such as pappescent Plants have, they not needing such ways of Conveyance for their seeds to be sown at a distance from them, their Tallness putting their seeds so high into ye Air that ye wind can carry them remote enough

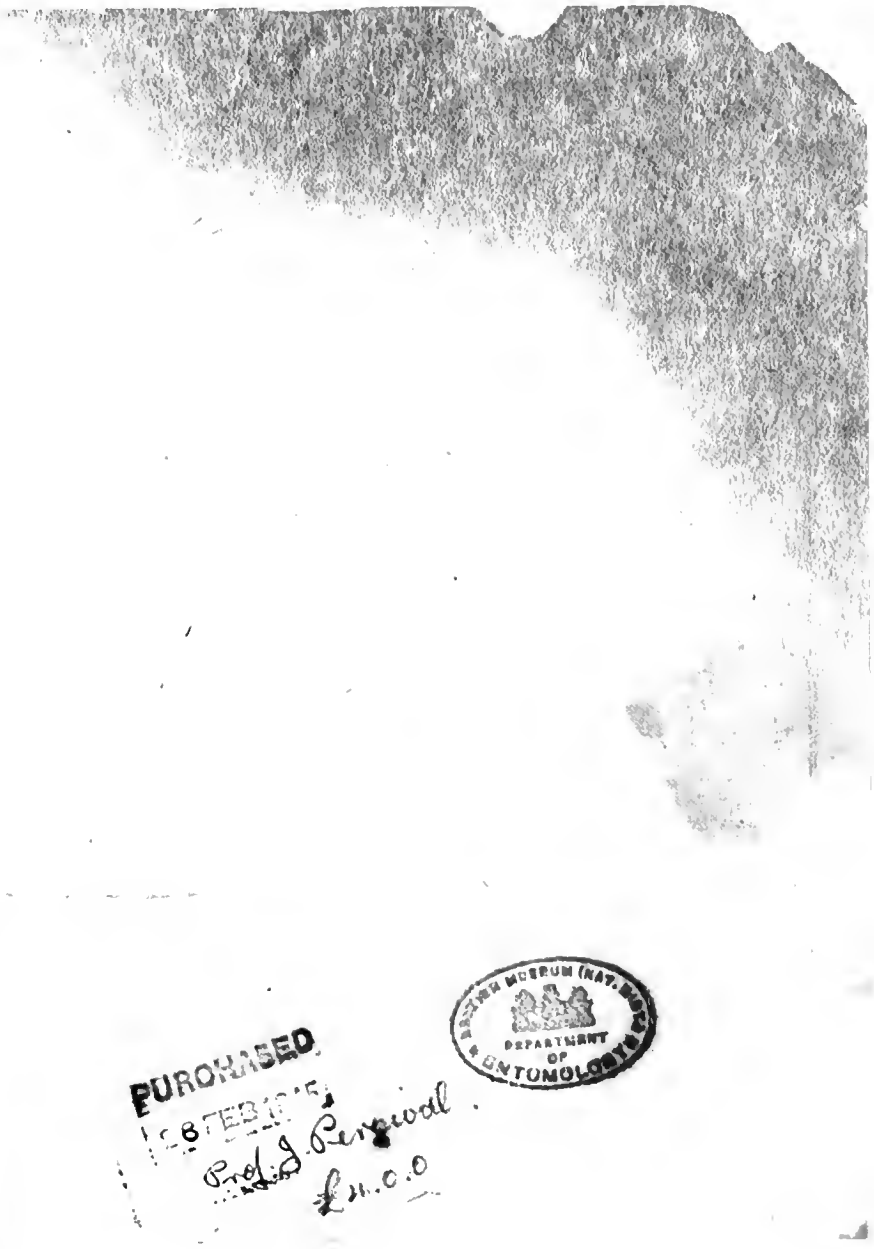
5. The same of water Plants whose seeds are sufficiently dispersed by their falling down into ye water, ye flowing of which carryes them into distant places.

[illegible] generally
[illegible] off them
without any way bruising their Vessells

7. The flowers of water Plants stand above y
[illegible] & the Seed y follows which would not
otherwise be dry to ripen.

8. Birds do often supply the place of a Sower
in Berrys especially that have stony seeds, which
pass through their Bodies, without losing their
aptitude to grow again, & being dung'd into
the Bargain.

9. The surface of the Leaves of Herbs good for
Food are smooth & free from down, which
would be unpleasant in the mouth, & not easy
to digest, as Cabbage, Lettuce, Beets, pursline
Parsley, Endive &c


PURCHASED
Prof. J. Percival
£11.0.0
DEPARTMENT OF ENTOMOLOGY

CONTENTS

Bulletin British Museum (Natural History)
HISTORICAL SERIES
Vol. 17 No. 1 May 1989

Historical Series

VOLUME 17 NUMBER 2 30 NOVEMBER 1989

The *Bulletin of the British Museum of Natural History*, instituted in 1949, is issued in four scientific series, Botany, Entomology, Geology (incorporating Mineralogy) and Zoology, and an Historical Series.

The Historical Series is edited in the Museum's Department of Library Series
Head of Department: Mr R. E. R. Banks
Editor: Miss P. Gilbert

Papers in the *Bulletin* are primarily the results of research carried out on the unique and ever-growing collections of the Museum, both by the scientific staff and by specialists from elsewhere who make use of the Museum's resources. Many of the papers are works of reference that will remain indispensable for years to come.

A volume contains about 256 pages, made up of two numbers: published Spring and Autumn. Subscriptions may be placed for one or more of the series on an Annual basis. Individual numbers and back numbers can be purchased and a Bulletin catalogue, by series, is available. Orders and enquiries should be sent to:

Sales Department,
Natural History Museum Publications,
British Museum of Natural History,
Cromwell Road,
London SW7 5BD

Telephone: 01-938-9386
Telex: 929437 NH PUBS G
Fax: 01-938-8709

World List abbreviation: *Bull. Br. Mus. nat. Hist* (hist. Ser.)

ISBN 0 565 09012 7
ISSN 0068 – 2306

Historical Series
Vol 17, No. 2, pp 167 – 258

British Museum (Natural History)
Cromwell Road
London SW7 5BD

Issued 30 November 1989

Typeset by J&L Composition Ltd, Filey, North Yorkshire

Bull. Br. Mus. nat. Hist. (hist. Ser.) **17**(2): 167–258 Issued 30 November 1989

Mrs Elizabeth Gray (1831–1924): a Passion for Fossils

R. J. CLEEVELY

Department of Palaeontology, British Museum (Natural History), Cromwell Road, London, SW7 5BD

R. P. TRIPP

41, Kirk Drive, Thornhill, Ontario, L3T 3KB, Canada

Y. HOWELLS

12, Ashmore Drive, Silverdale, Newcastle-under-Lyme, Staffs. ST5 6RL

CONTENTS

Mrs Elizabeth Gray, still collecting at the age of 92, this photograph was taken on a family visit to Balclatchie in September 1923

1. INTRODUCTION

Amateur fossil collectors have always made a valuable contribution to palaeontology. Inevitably, during the early days of the science their collections augmented the material gathered by the professional geologists and made a substantial contribution to its development. The various specialists and professional geologists were able to make only occasional forays into the field and either employed local residents to gather specimens, or had arrangements with quarrymen, or else had to rely upon the collections of amateurs to resolve the problems they encountered. Other naturalists, like the Sowerbys, who produced the early reference books encouraged such collectors to submit material to them for determination with the hope that they might have 'something new', which could then result in recognition of their effort by being named accordingly (Allen, 1976; Cleevely, 1983).

In his history of Scottish Palaeontology, Clarkson (1985: 1) has shown how the discovery & description of the rich fossil assemblages of the Palaeozoic sedimentary rock sequences of Scotland was largely conducted by self-taught amateurs. This was particularly the case with the thick sequence of Ordovician rocks, mainly clastics and limestones of shallow water origin with their rich, often unique faunas occurring around Girvan, Ayrshire. Mrs Elizabeth Gray, wife of the ornithologist Robert Gray, amassed considerable collections from this district and has been described 'as one of the foremost fossil collectors of all time' as a result of her redoubtable activities over a period of more than fifty years (*ibid*: 7). Her initial efforts were encouraged by the research interest & need for Palaeozoic brachiopods of Thomas Davidson and subsequently, by Charles Lapworth, who utilised the fossil faunas she helped to reveal to interpret and correlate the stratigraphy of the Girvan region.

Miss Etheldred Benett (1776–1845) is regarded as the first woman geologist (Cleevely, 1983: 54) through her wide involvement in collecting British fossils, particularly from the Cretaceous exposures of Wiltshire. The Philpott sisters (1833–40) were amongst the first to collect Jurassic fossils in Dorset on behalf of the specialists and were soon joined by the more widely known Mary Anning (1799–1847), partly to provide themselves with additional income. However, a decade later, Mrs Gray began a lifetime of collecting in the Girvan district of Ayrshire solely out of interest. She was a woman of extraordinary character and considerable determination, who as a result of these activities left a lasting name in Scottish geology (see Flett, 1937).

The Gray Collections have become of particular value because:

(a) a careful record as to the exact geographical location and geological horizon from which each fossil was obtained had been maintained; [this was also augmented by Mrs Gray's phenomenal retentive memory of each specimen!];
(b) it was also one of the earliest collections containing information as to the relationship of the specimens to one another; or attempting to ensure that part/counterpart were kept together;
(c) the collections formed the basis for many of the earlier descriptive papers and monographs by significant Palaeozoic palaeontologists [principally owing to its uniqueness]; this material also formed the basis of the fossil lists published by the officers of the Geological Survey in their Memoirs. As a result, the Gray collection contains many type specimens of British fossils and is also significant in the nomenclature of higher taxa.

Together with her daughters, Mrs Gray formed three collections of Girvan fossils; the first is now in the Hunterian Museum, Glasgow, the second in Edinburgh and the third, by far the most significant, was purchased by the BMNH in 1920. Later, her daughters contributed substantial material fo the BMNH to augment the original collection.

Apart from providing information on the accumulation of the fossils by the Gray family and their subsequent acquisition by institutions and their use by palaeontologists, the main purpose of this paper is to indicate Mrs Gray's relationships with these scientists. The extensive correspondence now preserved in the Palaeontology Library of the British Museum (Natural History) through the efforts of her daughter Alice and the co-operation of two former Keepers of Geology, Dr W. D. Lang & Mr W. N. Edwards, has enabled us to attempt this appraisal. In fact, examination of her lengthy correspondence with Dr F. A. Bather over a period of thirty years, reveals Mrs Gray's single-mindedness. To attain her objective of ensuring the description of 'her Girvan fossils' as quickly as possible, ideally in a series of monographs based on the Gray Collection, she somewhat overlooked the other tasks and difficulties that might beset the busy specialists, whom she had persuaded to undertake the work.

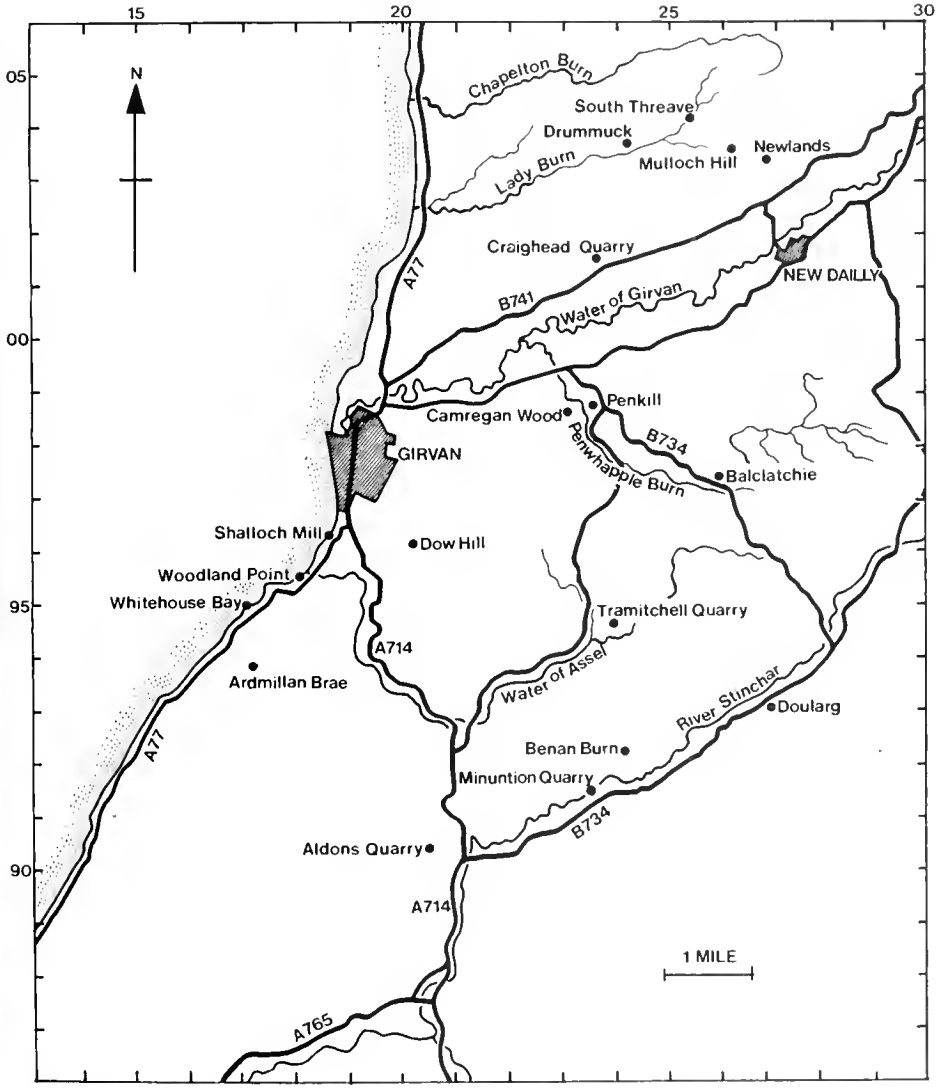
Recognition of the significance of the Gray Collection and the qualities shown by Elizabeth Gray in accumulating such a wealth of material, has led to several earlier attempts to write a short biography and record the history of the collection. However, neither the original attempt made by Alice Gray[1], nor a later effort by W. N. Edwards of the Department of Geology, BMNH[2] was ever published[3]. Fortunately, although W. N. Edwards' notes cannot be found, Alice Gray's earlier drafts have been preserved amongst the Gray papers[4]. In many respects, she might almost be considered as another author of this paper, for in addition to her biographical account of her mother, Alice was also responsible for the organisation of the Gray Correspondence, various family photographs and other relevant material into several bound volumes before presenting them to the BMNH in 1938. Furthermore, much of our own information on the Gray family and their collecting has been gleaned from the occasional reminiscences that Alice Gray made in her letters to the staff of the Department of Geology.

2. BIOGRAPHY OF MRS ELIZABETH GRAY AND HER FAMILY

The little biographical information available was provided by her daughter Alice in a brief account of Mrs Gray's life written at the request of the Geological Survey, after her mother's death[5].

Elizabeth, the younger daughter of Thomas and Mary Anderson, was born at the Burns' Arms Inn, Alloway, nr. Ayr on 21 February 1831 according to baptismal records (pers. commun. Daniella Shippey, 17 October 1985). However, Elizabeth Gray and her family always recognised 21 March 1831 as her birthday [see Biography MSS and letter 18 March 1913].

In 1836, her parents moved to the Girvan district when her father decided to leave his occupation as an innkeeper and become a farmer. At the age of fifteen, after education



Map of the Girvan area.

at a small private school in Girvan, Elizabeth was sent to a boarding school in Glasgow for a year. She then returned to the farmhouse at Enoch to assist her mother in looking after her six younger brothers. During this period, her interest in the local fossils was aroused by her father, who gathered specimens when travelling around the neighbourhood, particularly material extracted from nearby sites used in repairing the roads. Thomas Anderson was a keen naturalist, and in their monograph on the fossils of the Girvan district, Nicholson & Etheridge (1879: 165) dedicate a trilobite *Bronteus andersoni* to this 'intelligent and enthusiastic collector' and later named a coral after him (p. 273)[6].

Left: Robert Gray (1825–1887); pl. V from obituary published in *Glasgow Naturalist*, Vol. 4. *Right*: Family photograph of Mrs Elizabeth Gray in 1905 when she was 74 and there appears to have been a lull in her geological correspondence.

When Elizabeth was twenty-four she met Robert Gray[7], at that time a branch inspector for the City of Glasgow Bank and one of the typical gentlemen-naturalists of that era, whose interest in ornithology had brought him to Girvan to study the birds of the Ayrshire coast. Much later, in 1869, he was to publish a joint paper with his father-in-law on the birds of Ayrshire and Wigtownshire. Robert Gray also assisted Elizabeth in collecting her Girvan fossils, particularly from the easily reached Penkill and Balcletchie localities and together they made a substantial collection. They were married in 1856 and although living in Glasgow were able to continue their bird and fossil excursions by visiting Girvan each summer. The scientific partnership was helpful to both, for Robert Gray became a keen fossil collector and from the evidence of Davidson's letterbooks, possibly the instigator of their family fossil forays. It would appear from the numerous contributions that Robert Gray made to the Proceedings of the Natural History Society of Glasgow, that he was frequently travelling throughout Scotland and Elizabeth had to learn to skin and preserve the bird specimens required for their bird cabinet. In 1864,

Robert Gray read a paper in Glasgow on 'Observations in various branches of Natural History during the past summer', which referred to these fossils.

The original Gray Collection was presented to the Hunterian Museum, Glasgow University in 1866. Various short papers and accounts of exhibits based on the joint work of Mr & Mrs Gray were published in the *Proceedings of the Natural History Society of Glasgow* between 1868 and 1878, several of them dealing with the fossils. It was shortly after the first of these, in 1868, that Professor John Young, one of the authors, instituted a class in geology for women at Glasgow University[8], and presented a ticket to Mrs Gray. Apparently, she greatly enjoyed this opportunity – her only formal geological education – 'which provided some understanding as to the scientific value of the fossils she had collected' [Alice Gray MSS: 3].

A mixture of collecting, field observation and participation in local society activities is a predictable pattern of life for any young couple with a joint interest in natural history. However, it would appear that the Girvan fossils gradually became an absorbing pursuit. The growing family continued to spend its summer holidays at Girvan, presumably benefitting economically from family associations in the area, and each of the children were gradually introduced to assisting with gathering material for the collection. Alice Gray in writing about her sister Agnes [16 October 1937] recounts:

> Like all the other members of the family, she began to help our Mother in her childhood; at the age of 5 or 6 years she was a trusted worker. It was this same sister, who picked up the first *Cothurnocystis* ever found.

In another letter [18 March 1924], written after the death of her mother, Alice states:

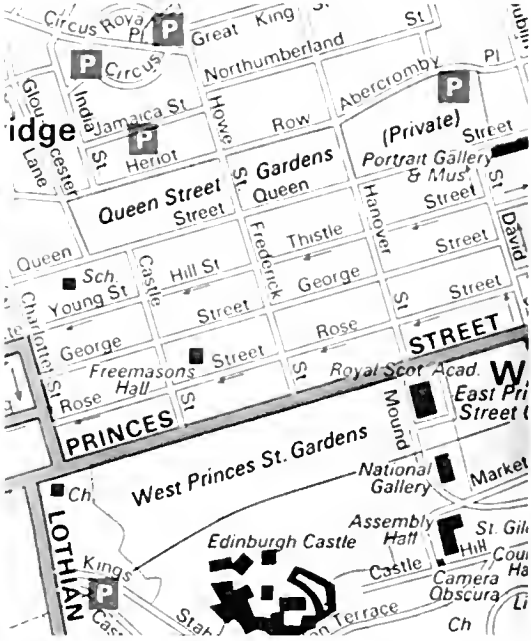
> We hope to carry on collecting as the work at Girvan has been our principal recreation ever since we can remember.

It is not surprising that in such circumstances, with all the children occupied in finding material, the Gray collection increased rapidly.

In retrospect it appears that Robert Gray may have shown good judgement when in 1874, he accepted a post at the head office of the Bank of Scotland in Edinburgh. Although he eventually became their chief cashier, his decision to move was of more significance in that his former employers the City of Glasgow Bank ceased business some 4 years later on 2 October 1878. The auditors reported that the Bank had lost its capital amounting to £1 million, the Reserve Fund of £450,000 and a further sum exceeding £5 million. The Directors, Manager and Secretary of the Bank were committed for trial and all were given periods of imprisonment.

The Gray's involvement with natural history and local societies was still continued for, following the offices and role he had held with the Natural History Society of Glasgow, Robert Gray became prominent in the various societies of Edinburgh (see Obituary *Proc. Roy. Soc. Edinb.* **15**, 1887 and *DNB* **23**: 19). In particular, after being appointed its Secretary, he was responsible for re-vitalising the Royal Physical Society, one of that city's oldest scientific bodies.

About 1880, according to Alice Gray's account, Dr Traquair, Keeper of Geology at the Royal Scottish Museum had suggested to Mrs Gray that she should describe her own material and had offered to teach her to do such work. However, she declined his offer, feeling that she could not hope to equal the authority of those who had devoted their lives to investigating particular branches of palaeontology. Instead, she preferred to devote her own energies to provide such specialists with ample material to complete their descriptions and interesting specimens upon which they could conduct their research, since her real enthusiasm lay in discovering and collecting fossils.



No. 59, George Street, the home of Mrs Gray and her daughters from the 1890s until 1945. This photograph shows the property in 1971 when the premises were occupied by the Dunfermline Building Society and the publishers T. & T. Clark (2nd floor). Alterations to the building had been made to provide the necessary separate access. No. 59 extends from the drain pipes (right centre) to a point above the doorway to the left of the Building Society's front. Reproduced with the permission of The Royal Commission on Ancient & Historical Monuments of Scotland.

Map section showing part of central Edinburgh to indicate the relationship of George St. within the city.

Robert Gray died in February 1887 having made his own particular contribution to natural history with the pioneer work on Clyde ornithology *The Birds of the West of Scotland* published in 1871. Unfortunately, its companion volume *The Birds of the East of Scotland* which he was preparing with William Evans at the time of his death was never published. Although ranging widely over the whole of the West of Scotland, the bulk of Gray's book provides the first genuine account of the birds of the Clyde area. The book has become a minor classic and one to which modern ornithologists are indebted. J. A. Gibson, to-day's specialist in Clyde ornithology, has written of the work (1981: 71): 'One of the masterly bird books of all time. As the years pass, being more and more highly regarded. . . . Gray brings the birds and bird-watching a century ago magically to life.'

It was only after her husband's death that the Gray family began their long residence at what was to become the familiar address of 59, George Street[9], and which was occupied by various members until 1944 (see p. 210). Mrs Gray survived her husband by thirty-seven years and maintained an interest in the Girvan fossils throughout that time and resolutely collected further material with the help of her daughters for all but the last few months of her life[10].

In 1903, she was awarded the Murchison Geological Fund by the Geological Society for 'her great services to geological science'. It was fitting that Professor Charles

Lapworth was the President to do this for in his address he was able to record 'that Mrs Gray had devoted the leisure hours of almost half a lifetime' to dealing with the fossils of the Ordovician and Silurian rocks of the Girvan district. Lapworth himself had accompanied her in the field, had benefitted from her collection and the precision of its accumulation, all of which he personally acknowledged in his address. (*Proc. Q. Jl.Geol. Soc.*, Lond., **59**: xlvii–xlviii). In her letter of reply, Elizabeth Gray wrote that her work had given her 'lifelong pleasure' and particularly the knowledge that it had been of service to many geologists. She emphasized that initially, her husband had shared in the pursuit of the fossils and in working them out, and greatly regretted that he too could not share her satisfaction in the recognition of their joint work. Mrs Gray was elected an Honorary member of the Geological Society of Glasgow, where she was regarded as the first and foremost of all the 'Silurian' workers (MacNair & Mort, 1908: 122); she also became a Fellow of the Royal Physical Society of Edinburgh.

Mrs Gray died of heart failure on 11 February 1924 following six days of acute bronchitis and within six weeks of her ninety-third birthday, her elder daughter Mary died the following week and in both death certificates bronchitis is given as the major cause. Alice Gray writing to Dr F. A. Bather about her mother shortly afterwards wrote (24 February 1924):

> The last day she was downstairs she looked over some fossils that she thought it might interest you to see . . . they were packed up . . . a letter was drafted & she was to write it next day. I now enclose a copy of it and hope to post the box of fossils tomorrow.

3. THE GRAY COLLECTION

(i) Collecting Methods

The methods adopted in collecting have been described in detail by Alice Gray (Mss p. 5). From the quarrying tools shown in the available photographs it would appear that substantial digging operations were often undertaken. Although Alice has written: 'that no rock was ever taken down needlessly and that every piece of rock was carefully broken up and if a specimen was not found immediately, examined to the last fragment.' Every effort was made to ensure that part & counterpart were kept together, particularly after several of the specialists who had utilised the collection had emphasized this point (see letters of Bather, 14 March 1900 & 31 July 1900). Alice Gray commented that they considered that: 'a fossil without its counterpart was little better than half a fossil' and if loose specimens were picked up, time was often spent searching for its other part. It may be that Bather's comment to Mrs Gray on the need for having both parts had influenced their practice, since in his view: 'having only one side merely raises the question without affording the means of settling it!'

Certainly, the earlier descriptions based on Gray material do not contain many examples of counterparts (see Nicholson & Etheridge, 1878–80, in which only 5% of the trilobites described fall into this category). In another letter, Bather (14 March 1900) comments on the particular value of specimens of starfish, where with impressions of 'both sides' available, excellent examples could be obtained in contrast to the material described previously by those authors.

Every specimen found was, at once, firmly wrapped up in paper and placed into a bag, or vasculum. In the evening, the day's work was not considered to be finished until that day's collection had been packed into small parcels and labelled with a locality. When the material was back in their home, the specimens were trimmed by means of fine chisels, or

1

2

3

1. Alice & Agnes Gray at Threave Glen, below the farmhouse at South Threave in 1922.
2. The family at the Starfish Bed, Lady Burn in October, 1922; from left to right: an unknown friend, Agnes, Mary, Mrs Gray, and Alice.
3. Alice & Agnes Gray at a roadside quarry, Balclatchie in October 1922.

a saw, so that space could be saved. All these trimmings were examined further in the search for additional specimens; [—in a letter to Bather (7 November 1907) she asks for the return of any trimmings from a specimen of *Cyclocystoides* he had agreed to develop for her]. Later letters of Alice Gray (4 May 1937) and her sister Edith (4 August 1942) mention boxes of un-examined material that they had been unable to process; the latter asks the BMNH for help in dealing with this material, pointing out that her sister had 'often come across unknown treasures on splitting stones . . . in the house'.

Subsequently, each separate piece was then labelled with its locality and horizon—often small printed tickets were used—, before the specimens were classifed and placed in cabinets, or stored temporarily in boxes. Yet, for some reason, Mrs Gray had decided not to resort to numbering her specimens. There is no indication why such normal practice was not adopted and one can only assume that her phenomenal memory made

this un-necessary. Evidence of her amazing recall of individual specimens is provided by several letters (to Bather: 16 April 1904, 12 March 1914, 2 August 1915; to Lapworth: 20 November 1898, 30 September 1919) when she enquired after particular specimens that they had not returned after their research, by describing distinctive features shown by each of these specimens, which frequently enabled them to be recognised. Another aspect of this, is the family's involvement with the collection through their use of 'pet names' for particular forms e.g. 'the boot' was a reference to *Cothurnocystis* (8 November 1911); 'the hat & feather' (11 August 1915); 'plated slugs' (4 May 1937); 'trumpet' for the columella of a gastropod (6 May 1937).

Elizabeth Gray had undoubtedly been encouraged by one of her advisers, or companions to adopt meticulous methods in her collecting. It is possible that since such information was so critical for Lapworth's research on the succession in Girvan, that he was responsible for instilling the need for such precision. As a result the collection, in addition to being relatively unique and one of the few available from the richly fossiliferous deposits of that district, was scientifically reliable. Lapworth and Reed took pains to praise Mrs Gray for this aspect of her collection arising from her thoroughness. Much later, Lapworth (10 June 1914) when asked to advise over the value of the trilobites stressed that:

> It was the very first collection in which the exact localities and horizons of every individual fossil . . . was written down at the time of collection . . .

Reed (23 February 1909 and 1909: 220) emphasized the value of having material, which enabled him to describe things 'with much more minuteness' and also that the regular visits and careful collecting over so many years enabled him to make conclusions as to the relative abundance of the taxa occurring at the various localities. Spencer (1914: 2) also echoed earlier remarks as to the value of having the counterparts, for . . . 'the casts are usually much easier to interpret than the specimens preserved in original calcite'.

After each Gray collection had been acquired by an institution, the family had immediately renewed their collecting activities during their annual summer and autumn visits to Girvan. In 1922, erect of figure and with sight undimmed, Mrs Gray was photographed at all her favourite collecting spots (Balcletchie, Whitehouse Bay, the Starfish Bed, Thraive Glen, Mulloch Hill, Woodland Point) and a last visit was even made in September 1923 at the age of ninety-two. During her almost seventy years of field collecting Mrs Gray had seen localities come and go; some became exhausted, others became overgrown, or unworkable in other ways, or, as in the case of two limestone quarries Craighead & Tramitchell commercialised beyond recognition so that the fossils were lost in the processing.

The keeness of their collecting is demonstrated by an annotation made by Alice Gray (Sheet LXVI NW) concerning the locality 'Bougang':

> In 1900, when my mother, her brother and I went there the quarry was almost full of water. Having been forewarned by Dr. Horne, we took a thin rope with us. It was then attached to me, held by my uncle and lying flat on the brink, I was just able to reach down and quarry stone to hand up to my mother to break up.
>
> The stretch of time between 1855 and 1936 is a long one and it is safe to say that the work . . . during that period has been carried on in the same way . . . (Alice Gray, letter 4th May 1937).

After Mrs Gray's death, the surviving daughters had made the annual pilgrimage to continue their mother's work,—even during the difficult years of the Second World War. From her letters, it would seem that the summer of 1940 was the last occasion they had

made any real finds, when Alice recorded (15 June 1941) that their local driver had promised to do his best to overcome the petrol shortage 'rather than see us beat'. Eight months later Alice died and her surviving sister Edith then wrote:

> I fear the continuity of collecting must now stop, as I have not my sister's scientific knowledge and was only her helper.

A family tradition from the summer of 1855 to September 1941, had ended after eighty-six years!

(ii) Mrs Gray's Localities

The first reference to the Gray's Girvan localities was that made by Mr J. Young (TD notebook 25 January 1865) which tells of the Grays collecting from a site they had newly opened near Penkill farm. Robert Gray adds further details in his own letter to Davidson (29 July 1865) and later (17 September) refers to Balcletchie, Craighead, and Penkill[11]. Davidson mentioned each of these in his monograph on the brachiopods.

Another early indication of Mrs Gray's localities is obtained from a list she drafted for Lapworth's approval (see Gray Correspondence, Vol. 1, No. 1). This is also accompanied by the draft of his covering letter which suggests that the information is provided for Thomas Davidson's work on the brachiopods and also indicates their uncertainty as to the precise age of the fossils.

> Dear Mrs Gray, Nuneaton
> Am writing this in train. Would have answered your former note but not a moment for anything, just now—even sleep!
>
> The above list is now correct. I should recommend you to ask Mr Davidson to use **Llandeilo**—not Upper Llandeilo.—We don't know what Upper Llandeilo is just now. The beds are Llandeilo but that is all we can be sure about. Will write whenever I've a moment.
>
> Kindest regards to all
> Kindly excuse calligraphy.
> Will post this at Atherstone
>
> Yours very sincerely
> Chas. Lapworth
>
> P.S. Please be careful about Thraive Dyke bed, and see that fossils from true Starfish Bed are not mixed with the Meristella beds. The former are Upper Bala. The latter are Lower Llandovery.

The record of a letter from Lapworth (24 February 1882) in the Davidson notebooks dates this list and confirms the reason for its compilation. The lengthy faunal list that Mrs Gray provided later for inclusion in the memoir published by Peach & Horne (1899) contains more localities, while Nicholson & Etheridge (1880: 7) had referred to forty localities in the Girvan district (see Appendix 4 for List of Gray localities)[12]. Owens (1973: 3) pointed out that the main drawback is that all these original sites are only vaguely localized and other recent workers (see Howells, 1982; Harper, 1984: 7) have shown that these sites have often been confused, joined, or generally misunderstood by the specialists describing the Gray Collection and subsequent collectors. Full detailed lists of the localities for particular fossils have been provided in the monographic studies made by Williams, 1962; Howells, 1982; Harper, 1982; and Paul, 1984, who have all listed them under the relevant stratigraphic formation.

The first Gray collections were undoubtedly obtained from local sites around Girvan

within walking distance of the home of their relatives. It must have taken at least an hour to reach Drummuck, where many of the specimens described by Nicholson & Etheridge were found. Horse and carriage, and later rail were the only transport available for longer journeys; later Alice Gray refers to their use of a hired car (see letters to W. N. Edwards *c.* 1941). The lack of material from rich fossiliferous sites in the Stinchar Valley, suggests that Mrs Gray did not venture into that area; there is only one trilobite from Aldons [the unique harpid mentioned by Reed, 1903], little from the highly fossiliferous basal Superstes Mudstones, and only two pygidia of the trilobite *Pliomerella craigensis* (Reed, 1906) in her collection from the enormously rich Auchensoul Quarry. She is unlikely to have visited any of these sites without coming away with abundant material. There is also only a handful of specimens from the localities of Benan Burn, Doularg, Minuntion and Tormitchell, all of which were know to Lapworth (1882)[13]. It is possible that the Gray family were quite satisfied to concentrate on the places that they knew and had always exploited. There was some sense in this for it is now known that the Gray family's locality 'Bargany Pond Burn' was not that of other collectors, but a quite different locality that they had discovered as a result of following and mis-interpreting directions to the original site.

Mrs Gray never recorded her localities on any map, but in 1937 Alice Gray endeavoured to record them all from memory on six-inch Ordnance Survey maps, which she presented to the BMNH. In her letter to W. N. Edwards (4 May 1937) she wrote:

> . . . I found that the present generation of geologists, who have worked in the Girvan district, are not so well acquainted with some of the localities as we are . . .

She provided the set of maps[14]

> marked with all the localities from which my mother collected her fossils . . . in case of any doubt or dispute.

It would appear from her letter that comment by current geologists over Lapworth's account of the exposure of a particular bed had prompted this action for Alice Gray continued:

> Professor Lapworth was right and to-day's geologists wrong! We worked at the bed in question before to-day's geologists were born and for many years it has been overgrown[15].

However, despite her own assurance, it would appear that at times her memory was at fault, or more likely, that she was unfamiliar with reading maps to establish the sites of localities, for several of those marked are quite impossible for the horizons of the material (see Howells, 1972: 4, for several instances of this). Her annotations to the maps indicate that she had considerable uncertainty: see sheet LVI NW where several localities are marked 'to the best of my recollection' and Sheet LVI SE where she has written against the locality 'Auchensoul':

> on the Auchensoul Burn somewhere—I myself was never there!

Harper (1984: 7) has provided a method for differentiating between the localities 'Drummuck', 'South Thraive', 'Starlish Bed' and 'Cliff Section' as used by the Gray family and subsequently treated as one by Reed. Howells (1982: 3) has shown how to distinguish specimens obtained from several sites denoted as 'Mulloch Hill', the general area from which they were collected, on the basis of their lithology and differences in

weathering. A photograph in the Gray Album of the three sea stacks at Whitehouse Bay, enabled Ingham to identify the site despite its now being worked out.

(iii) The use and users of the Gray Collections

A glance at the accompanying bibliography will reveal the principal users of the material that Mrs Gray and her family had collected. These were relatively few and somewhat alarmingly, most were essentially institution-based palaeontologists. Only Lapworth had any real interest in, or knowledge of the Girvan district and of the others perhaps only Davidson & Nicholson (and later Spencer) had any real field experience, consequently mistakes were made in naming taxa and determing relationships and age. Comparison of Mrs Gray's relationship with the various users of her collection from the few surviving letters and other records indicates that, in many respects, the degree of affability was governed by the extent and speed with which these palaeontologists fulfilled her goals for the determination and description of the fossils. Although obviously any personal, rather than just scientific acquaintance, affected the level.

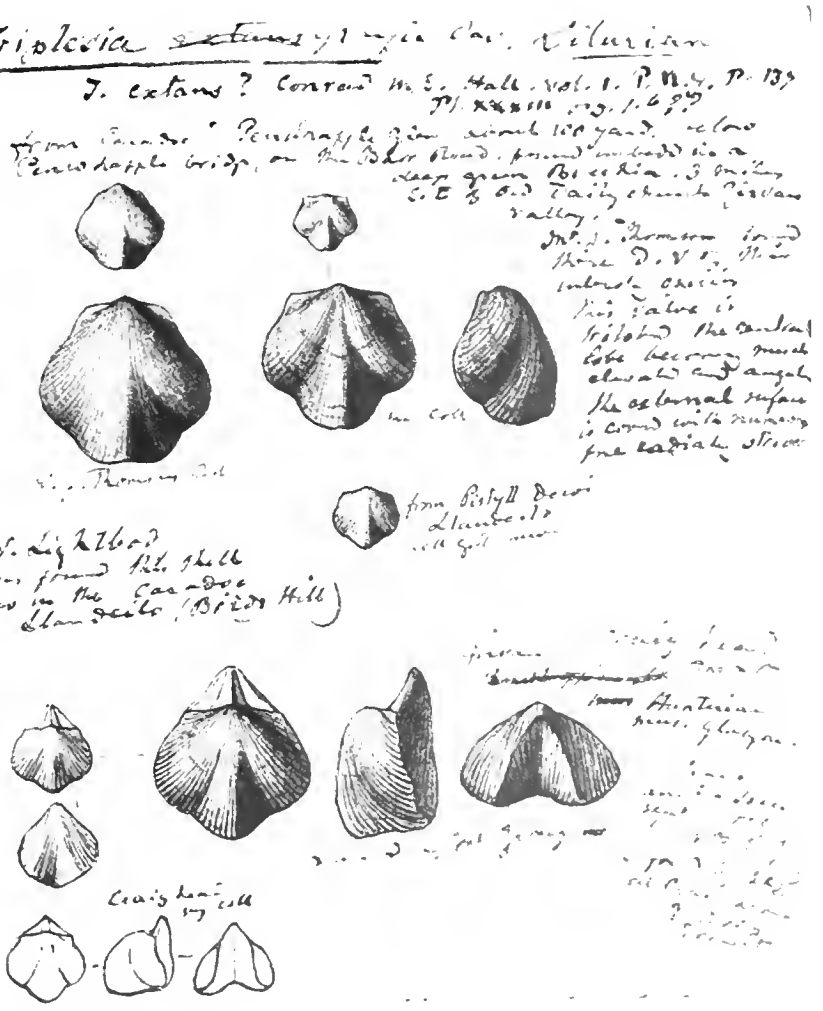
One of Mrs Gray's earliest correspondents was Thomas Davidson[16], who was probably the first specialist worker to utilise her material when describing several new species from her collection in his monograph on the *British Fossil Brachiopoda* (1866–71). Alice Gray, in her biographical Mss states: 'as far back as ... 1860, she was in correspondence with Thomas Davidson'. This is unlikely, for as Mrs Gray herself apparently wrote in a later letter to Davidson (8th April 1882): 'I may mention that it was in 1863, I first collected fossils ...' and in even later letters to Dr Bather (27 March 1913 & 15 October 1914) this period is indicated! There is undoubtedly some confusion as to the time the collection was begun, for in other letters Alice Gray refers (24 January and 4 May 1937) to 1855 as being the year that the family custom of collecting fossils at Girvan was begun by her mother, in fact this would be the year that she met her husband! It is possible that Mrs Gray's comment quoted above referred to the time that she began to collect in a more precise manner, for some of the Hunterian material was undoubtedly collected earlier.

(a) Thomas Davidson (1817–1885)

Davidson was born in Edinburgh (17 May 1817), the son of a wealthy Scottish landowner, but was educated in Europe. His inclination for the fine arts was encouraged through attending classes in Paris, while his interest in natural history was influenced by access to the various institutions and the guidance of Constant Prevost[17] in accumulating a collection of geological specimens from the Paris Basin. This new interest in geology was maintained by his attending lectures in Britain, surveying in Scotland and subsequent field work throughout Europe. After making the acquaintance of Leopold von Buch[18] during a visit to Italy in 1837, Davidson was persuaded to undertake a comprehensive study of both living and fossil Brachiopoda.

As a man with private means he was able to devote much of his time to such research in his own home, first in London and subsequently at various places in Brighton. Davidson's artistic abilities enabled him to overcome one of the main problems in dealing with a wealth of material and ensuring its recognition. His working methods have been described elsewhere (Cocks, 1978; Mancenido & Cocks, 1986) but the letterbooks demonstrate that Davidson endeavoured to just concentrate on particular taxa at any one time. For that period, his correspondence is only with other interested parties and solely devoted to that subject until it had been resolved.

Davidson's role and scientific achievements were widely acknowledged during his lifetime by numerous society awards. Professor Young (26 October 1882) had recognised that it was Davidson's enthusiasm which encouraged everyone to assist in the provision of material, particularly that from the strata of 'Dear Auld Scotland'![19]



A page from Davidson's notebook showing his notes on *Triplesia grayii* and other specimens borrowed from the Gray collection during the preparation of his monograph; Mss held by the Brachiopod section, Department of Palaeontology, BMNH.

Davidson's notebooks[20], preserved in the Brachiopod section of the Department of Palaeontology, [for further description see Cocks, 1978: 4] contain some indication of his use of her material in the preparation of his monograph, through the annotations he made to the drawings of the specimens he had borrowed, but give no clear evidence of the dates. However, another series of letterbooks preserved in the Palaeontology Library, in which Davidson listed all his correspondence and appointments, provides definite evidence concerning his collaboration with Mrs Gray during the period between

1867–1884 and an idea as to the frequency of their communications. These references also indicate, not surprisingly, that 'Mr.' John Young[21] provided the introduction through his association with Robert Gray at the Natural History Society of Glasgow. They also demonstrate that, initially, Robert Gray himself, was also more directly involved in collecting the fossils than had been thought.

It was in January 1865, that Young informed Davidson of the Gray Collection in which '. . . many of the Brachiopoda were in a fairish state of preservation . . . only wanting a little trimming & cleaning . . . to make them worthy of figuring.' Robert Gray confirmed his readiness to let Davidson examine all their Girvan brachiopods (22 July 1865) and gave an account of his activities in opening up various exposures to obtain the fossils (e.g. Penkill: 29 July & 17 September). The promised box of specimens arrived on 13 September and Davidson promptly returned them a month later. This pattern was repeated in subsequent years after the Grays had returned from their summer forays to Girvan and, at that time, they willingly agreed to Davidson having any duplicate specimens he required and undertook to search for anything else he needed. Virtually all the references to this correspondence record the receipt, or despatch of specimens. The year 1882 was particularly busy as Davidson borrowed many of the brachiopods in the Gray collection in a series of Lots sent over a period of four months, during the preparation of the Supplements to his Monograph. Contrary to Alice Gray's assertion, the first letter written by Mrs Gray appears to be that of 7 October 1867, when from Girvan, she sent a complete specimen of the *Triplesia* that was eventually named after her.

Left: Professor H. A. Nicholson, FRS (1844–1899) photograph in Palaeontology Library Archives, BMNH. *Right*: Thomas Davidson (1847–1885) photograph in *Challenger* Expedition Archives held by the Mineralogy Library, BMNH

Thomas Davidson very probably set the pattern by which Mrs Gray subsequently judged everyone else, while his research on the Palaeozoic brachiopods may also have led to Mrs Gray devoting her life to the acquisition of the Girvan fossils. His prompt treatment of the various consignments sent for examination in the preparation of the Palaeontographical Society monograph on the Brachiopoda, gave her little anxiety; the material was always sent back within a few months and usually a few weeks and occasionally within days. The inclusion of several rare forms in the earlier samples encouraged the Gray family to search for other examples e.g. *Triplesia Grayi*. As pointed out above, initially Mrs Gray—or very probably her husband—was also far less possessive over the material and their collecting activities were undertaken to provide the specimens that might be of assistance to Davidson. The fact that he utilised their observations also added to their pleasure and gave a feeling of involvement with the science.

Impressed by the quality of Davidson's figures, Mrs Gray promised to supply him with a set of duplicates. She repeated this promise frequently, until, in 1884, it was eventually fulfilled and their correspondence apparently ended for there is no further reference to her in his letterbooks. In view of her pleasure with Davidson's work and thoroughness, it is odd that Mrs Gray did not preserve many of his letters – only a single example has survived and that is not really of any consquence! The protracted promises about duplicates made by Mrs Gray suggest that her acquisitiveness—even at that early stage—was far stronger than any obligation she may have felt towards him. It is interesting to note that although Davidson made frequent visits to Scotland and embarked on occasional field trips, he seldom visited the Gray family.

(b) Charles Lapworth (1842–1920)[22]

In 1873,—a few years after Mrs Gray's introduction to Davidson and the subject of geology,—Charles Lapworth began work in the Girvan District. Mrs Gray assisted in his exploration of the area and provided many of the fossils cited in his faunal lists and upon which his work of correlation was based. Often at Lapworth's instigation, her collecting forays were in search of particular taxa that he predicted, or expected careful collecting should reveal, as occurring at certain horizons. References in later letters indicate that their association was enjoyable:

> Those were happy days (in spite of the hard work) when the geology of the Girvan district was being worked out . . . and your family put in such fine work among the fossils; all of which was of the greatest service to myself then; and to the Geological Survey and Geological science in general ever since. (Lapworth, 12 February 1917)

In other letters there are frequent reference to the *'dear old Girvan land'* and Lapworth's interest in particular beds. (T. Davidson: 26 October 1882).

Lapworth's early life was spent in the Home Counties, born at Faringdon, educated in Buckland and then becoming a pupil teacher at his own school, before entering a training college at Culham, near Oxford. In 1864, he chose to take an appointment at Galashiels in the Border country and his first paper 'On the Silurian Rocks of Galashiels' was read to the Geological Society in 1870. After being appointed to Madras College, St Andrews, he became friends with Professor H. A. Nicholson and D'Arcy Thompson. Soon after, he published (1879) the paper in which he founded the Ordovician System and which has been considered to be a masterpiece of moderation and persuasive writing. In 1881, he was appointed to the newly established chair of Geology at Mason College (now Birmingham University), and this enabled him to undertake several seasons of arduous field work, but his health suffered under the strain. He was able to complete a paper on 'The Girvan Succession' (1882), in which he made use of Mrs Gray's collection and also

confirmed the zonal value of graptolites which he had established in his earlier paper on the Moffat Series (1878). In due course, after considerable argument, the officers of the Geological Survey adopted his structural interpretation in the preparation of their memoir on the Southern Uplands (Peach & Horne, 1899); Mrs Gray's collection was also the basis for several of the lists given in this work.

Lapworth went on to investigate the Northwest Highlands and his work helped to resolve the controversy over the structure of this area. In the last phase of his career, he investigated the rocks around Birmingham, in particular the Cambrian of the Lickey Hills. Although his field ability and interpretative insight enabled Lapworth to make significant contributions to British structural geology, official recognition of his achievements has also emphasized the influence made by his teaching concluding that his original ideas had fertilised the research of generations of geologists (1899: xl; Watts, 1939: 277).

His main characteristic was an intense mental and bodily energy, which were so great that they frequently overtaxed his health. A burning enthusiasm to discover the truth and a delight in overcoming obstacles contributed to this driving force. Having made a substantial contribution to British Geology, he died on 13 March 1920 after another long illness.

Undoubtedly, Mrs Gray's contact with Charles Lapworth was conducted on a friendlier level than most of her other correspondence. Their letters to one another are much longer and frequently mention other personal matters. On each occasion that she considered selling her collection to the British Museum, Mrs Gray sought advice from Lapworth[23]. He, in turn, went to a considerable amount of trouble to assist her and sent a lengthy letter outlining all the possibilities but concluded with a suggestion as to the course she should follow. Yet, despite their good relationship, when there were problems over her specimens, Mrs Gray was still capable of chasing him for missing material. Their last surviving letters concern Lapworth's embarassment at the loss of several graptolites over the years, probably occurring during the transfer of his Department into new premises[24].

It would seem that Lapworth was also involved in Davidson's later arrangements to use the Gray Collection, for he endeavoured to co-operate with Davidson's revision by completing his own contribution on the geological succession occurring in the Girvan district (see TD: 24 February 1882). Lapworth also wrote to Davidson (TD: 27 Febuary 1882) assuring him over certain specimens: 'I doubt not that Mrs Gray is right in her locality'. Mrs Gray repeated this assurance herself (TD: 2 March 1882), when she had:

> . . . much pleasure in sending the rest of the Brachiopods Horizon by Horizon according to Prof. Lapworth's work. You may feel assured I shall be the most particular with respect to the localities of all the specimens I send you . . . and the plan you have chosen . . . will I think, render mistakes impossible

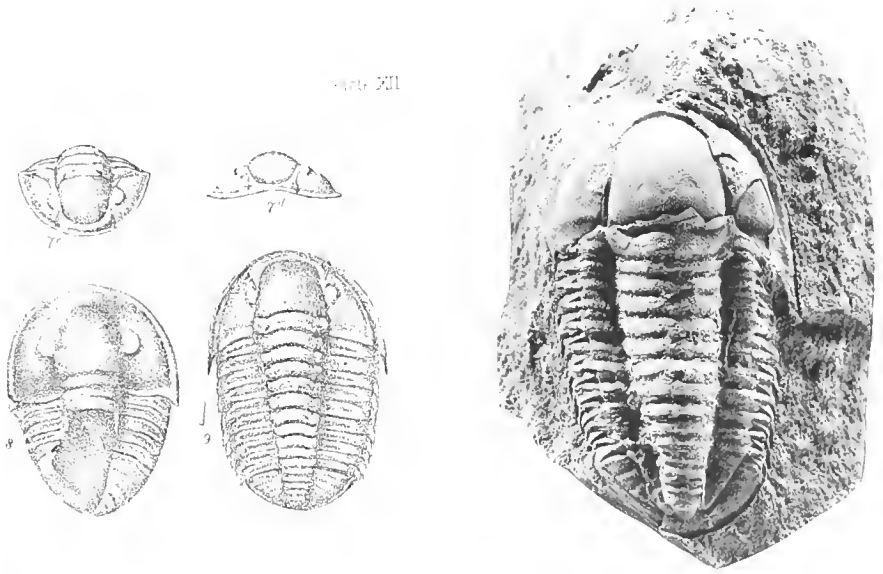
Yet, a number of letters during September and October 1882 concern her finding a specimen of *Triplesia grayi* at the locality of Minuntion, which Mrs Gray finally admits was a mistake (TD: 26 October 1882).

Within a few months, Davidson had dealt with much of the material, for Professor Lapworth wrote (TD: 25 May 1882) to congratulate him on the 'magnificient table of Mrs Gray's shells' and declared: 'it is the most brilliant useful bit of work from another palaeontologist that has ever fell to my assistance & benefit'. According to later entries, Davidson had completed his examination of the Gray material by the end of 1882; even in June, Lapworth had written: 'I was certainly amazed at the work you had done during the past 5 weeks.'

(c) H. A. Nicholson and R. Etheridge, Jnr

The three fascicules of the first major monograph (1878–80) on the fossils of the Girvan district by H. A. Nicholson and R. Etheridge [25] were also largely based upon material in the 'Gray Collection' as is indicated by the title of the work. The Preface acknowledged their debt for 'the free and uncontrolled use of her cabinet' and 'for providing the most complete series of the . . . fossils of Ayrshire'. Subsequent collecting by Mrs Gray in the succeeding summer seasons, often at new localities, led to description of the additional material in a further fascicule (see Benton, 1979: 7).

It is not quite clear, how Nicholson & Etheridge became aware of the Gray collection, but a clue is provided by their reference to her father's collection being well known to all Scottish geologists (see p. 172) and a considerable number of the species are named after members of the family[26]. However, none of their correspondence has survived and the only evidence for a visit to Mrs Gray is provided in a letter by Etheridge to Davidson (TD: 22 November 1881) reporting that he had borrowed some brachiopods, which he felt Davidson should also examine. Although, in their monograph, it is mentioned (1878: p.vi) that: 'a visit to the ground in person has resulted . . . in giving us a direct knowledge of the rocks.'



Left: Original figures of *Proetus girvanensis* published by Nicholson & Etheridge (1880) in *Silurian Fossils of the Girvan District in Ayrshire*, pl. XII, figs. 7, 8 & 9. *Right*: Lectotype of *Paraproetus girvanensis* (N. & E.), BMNH In. 21926 × 1, Upper Ordovician, Ardmillan Series, Drummuck Group Mudstones, Drummuck, Mrs R. Gray Coll'n. 1920.

Henry Alleyne Nicholson (1844–1899) had been appointed to the chair of Natural History at St Andrews in 1875 and later, in 1882, became Professor at Aberdeen. His palaeontological work ranged over most fossil invertebrate phyla and remains of fundamental taxonomic importance; he specialized in stromatoporoids and corals (see Benton 1979: iii–v; Cleevely, 1983: 214). Benton (ibid: iii) established that Nicholson

was one of the earliest workers to use thin sections for determining internal structures of bryozoans and corals and to then utilise this information for taxonomic work. Since it is thought that Nicholson cut many of the sections himself, we can only assume that the Gray material was dealt with at St Andrews.

His collaborator, Robert Etheridge, Jnr (1847–1920) had begun his career as a field geologist in Australia with the Geological Survey of Victoria. When this organisation was disbanded in 1873, he returned to the U.K. joining the Geological Survey of Scotland. At the time of his work with Nicholson, Etheridge had been appointed to the staff of the British Museum (Natural History) and both father and son were engaged in dealing with the transfer of the collections from Bloomsbury to South Kensington. He worked principally on Palaeozoic invertebrate fossils. Subsequently, in 1887, Etheridge returned to Australia, holding several Survey and Museum appointments, before becoming the Director of the Australian Museum, Sydney in 1917 (see *Rec. Aust. Mus.* **15**: 1–27, 1926).

Their Girvan publication was supported by a grant from the Royal Society of Edinburgh and in the Preface of the first Fascicule, the two authors also recorded their gratitude to Robert Gray for providing additional financial help towards publication (see p. vi). Later, in a letter (TD: 19 November 1881) Mrs Gray reported that progress on 'Nicholson's Ayrshire work' had stopped owing to lack of a further grant from the Royal Society [of Edinburgh]. The following year, in another letter (TD: 25 March 1882) Mrs Gray expressed her obligation to Davidson for having 'worked out' her Girvan material, unlike Nicholson & Etheridge, who had decided not to continue. Mrs Gray seems to have gradually become disenchanted with the progress of their monograph and its eventual abandonment caused her to seek the help of other specialists to deal with the undescribed mollusca.

Both Henry Woodward[27] and his friends Professor T. Rupert Jones[28] provided notes to be used in the second fascicule (see pp. 211, 216) and as a result were later, briefly involved again. Woodward (1885) described two specimens collected by Mrs Gray at

Left: Professor Charles Lapworth (1842–1920) portrait in *Geol. Mag.*, 1901, Dec.IV, Vol.**8**: opp. p. 289. *Right*: F. R. Cowper Reed (1869–1946) photograph in Palaeontology Library Archives, BMNH.

Thraive and named a new chiton after her in recognition of her contributions to palaeontology; this species *Helminthochiton Grayiae* has since been recognised as the type species of the genus *Septemchiton* Bergenhayn (see Rolfe, 1981). T. R. Jones dealt with several of her specimens of Ostracoda in later papers (1886, 1893*a*,*b*).

(d) F. R. Cowper Reed (1869–1946)

It would appear that Bather was responsible for suggesting that Reed should deal with Mrs Gray's trilobites, following Nicholson's reluctance to continue[29]. Reed later succeeded Davidson in dealing with her brachiopods and the high quality of his revision of these Palaeozoic fossils is reflected in its relevance and acceptance to-day. A letter from Mrs Gray (*c.* Feb. 1911) concerning her reluctance to allow the use of the Girvan material by any researcher, mentions his involvement. Her reaction to the use of 'her specimens' by O. T. Jones without 'her permission', prompted a stream of letters to various geologists. By way of explanation, Mrs Gray argued that since the specimens 'were never trusted to him [O. T. Jones] ... for examination' she should refuse her consent to any proposal that might rob Reed's future work of 'some of its interest'—by this we infer she meant the chance of describing new taxa.

Reed spent the greater part of his life in Cambridge, arriving as an undergraduate in 1888, then later obtaining an appointment as an Assistant to the Woodwardian Professor of Geology in 1892. He retained that post, essentially curatorial, for a further twenty-five years while T. McKenny Hughes held that Chair. Reed's doctoral thesis (? 1890) was on volcanic intrusives, and he received the Sedgwick Prize for work on the geological history of the rivers of East Yorkshire. But, after writing on the geology of the Fishguard district (1895), Reed appears to have concentrated on palaeontology. According to A. G. Brighton (pers. commun.) his chief duties as assistant were the curation of the collections at the Sedgwick Museum. When the Chair became vacant *c.* 1917, Reed was so disappointed at J. E. Marr's appointment that having independent means, he relinquished all his official duties with the Sedgwick, but maintained his room for research work.

It was through earnings from his research and descriptive work, mainly undertaken for the Geological Survey of India, that Reed was able to augment his private income. Consequently, although he was primarily concerned with Palaeozoic fossils, in such circumstances, he did not hesitate to investigate much younger faunas. As a result, Reed covered a very wide field, dealing with many groups of invertebrates, but was especially interested in the brachiopods and trilobites. He frequently sought advice from his contemporaries, while correspondence with Dr Bather from 1904–1925, shows that they collaborated in describing and obtaining foreign echinoderm material[30]. During his life, Reed made numerous journeys overseas, mainly visiting countries forming part of the British Empire in collaboration with his work for the Colonial Survey and leading to the publication of a textbook *The Geology of the British Empire* (1921).

Immersed in his work, Reed gave the impression that he lead a somewhat solitary existence, e.g. James Begg considered him to be a recluse. Although married but with no children, it may be that his wife's habit of kitting him out each day with a spare pair of socks (carried in a binocolar case) and his practice of arriving and leaving his room in the Museum without seeing anyone, contributed to this view. His use and knowledge of geological literature was extensive; it is said that although he was seldom seen in the Geological Society's library, he used and borrowed more of their books than anyone else.

Over the years Reed produced a steady stream of papers describing Girvan fossils, but it would appear that he never visited the area. In a letter to Mrs Gray (23 February 1909) following the completion of a paper on hyolithids, he commented that her material had enabled him to describe new species 'with much more minuteness than is generally possible' and that the meagre accounts of other British species made comparison very

irritating! He quickly dealt with all material, seldom developed a specimen and relied upon his memory and previous publications; the ready availability of his own first rate artist, who was experienced in presenting the essential features of any specimen contributed to his quick turnover. Once he had 'retired', Reed's time was solely devoted to such research. Inevitably, it was this fast rate of progress that led, in 1911 (see p. 198), to Mrs Gray asking Reed to undertake the description of her cystids, after experiencing years of exasperation with Bather's promises and the protracted loan of her material. However, even Reed took time dealing with her specimens when preparing his various contributions for his Palaeontogaphical Society monograph on the Girvan Trilobites (1903–35).

Apparently, Mrs Gray had such a good impression of Reed, that in 1917, when his position at Cambridge lapsed, she sought Lapworth's help to obtain another post for him. Lapworth readily appreciated his palaeontological work and promised to bear him in mind, musing that were he a millionaire Reed would be just the man to pay for as the first Professor, researcher and lecturer in palaeontology in Britain (20 November 1917).

(e) Other Users

The problem of determining the starfish specimens is frequently mentioned in surviving Gray correspondence. Nicholson & Etheridge (1880: 318) stated that her first starfish specimens were found in 1879 at Thraive Glen. Initially, J. R. Gregory[31] had undertaken to deal with them, but upon leaving the BMNH in 1899 for a post in Melbourne he returned everything to Mrs Gray (19 December 1899), suggesting that he would have preferred to have dealt with a larger series in order to distinguish their specific characters. Shortly after, Charles Schuchert then at the U.S. National Museum, Washington used casts of new Gray material provided by Bather, which were far better than those originally figured by Nicholson & Etheridge.

In 1908, after Mrs Gray had again raised the matter, Bather (1 December 1908) suggested the names of W. K. Spencer (see below), a school inspector, and Dr F. Schöndorf of Hannover, but admitted that he did not have sufficient confidence in Spencer's ability to tackle the difficult Palaeozoic forms. Schuchert, after having moved to the Peabody Museum, Yale University, wrote (31 March 1911) that museum duties at Washington had prevented him from producing a monograph on the Palaeozoic starfish, but he now hoped to complete a descriptive list of their taxa[32].

The same year, following the cystid confrontation[33], Bather also had occasion to amend his opinion of Spencer's competence (8 April 1911) and considered that this 'seemed the best chance of getting the work accomplished' and it was arranged for Mrs Gray's material to be sent to the BMNH on his behalf.

William Kingdon Spencer (1878–1955). On completing his degree, he had served as demonstrator/lecturer at Oxford in 1903, and it was during this period he first became interested in Palaeozoic echinoderms. Shortly after his marriage, and then lecturing at Bangor, Spencer joined the Board of Education as an Inspector of Schools in 1904, and was eventually appointed as Inspector for East Suffolk (1914–38), becoming a significant figure in the world of education through his methods and schemes.

His research on Palaeozoic and Cretaceous starfishes was carried out during his leisure and consequently, he had little opportunity for fieldwork. Spencer's ingenuity in preparing the natural casts of the Palaeozoic material contributed to the success which enabled him to become a world authority[34].

On being approached to deal with the Gray material, Spencer responded immediately (15 May 1911) and gave his opinion that the valuable Gray collection was: 'in many respects the best collection of Palaeozoic Asteroids in existence.' A few years later, Mrs Gray wrote to Bather (27 March 1913) reporting that the Palaeontographical Society had

W. K. Spencer, FRS, FGS (1878–1955) portrait in *Biogr. Mem. Fell. Roy. Soc., London*, **2**, 1956: opp. p. 291.

accepted Spencer's monograph on *British Palaeozoic Asteroidea* and exclaimed: 'I owe you a debt of gratitude for introducing him to me.'

Whether Mrs Gray remained pleased is doubtful, for Spencer emulated his sponsor and never completed the monograph, although various parts were published between 1914–1940. Yet, he did fulfil his original promise to Mrs Gray by producing a general paper to provide due recognition of her contribution to science (Spencer, 1929). From correspondence with Bather, it would appear that much of Spencer's work was achieved by means of casts made from the Gray material held at the BMNH, only ocasionally did he find it necessary to see and ask for the originals (see FAB file: 16 September 1915, 12 October 1916).

Mrs. J. Longstaff (née Donald) (1855–1935). Jane Donald was encouraged to undertake research on Palaeozoic gastropods by J. G. Goodchild (1844–1906) of the Geological Survey, who had incidentally provided Dr Bather with Mrs Gray's address in 1892. L. R. Cox, in her obituary notice (*Q.J.G.S.* **91**: xcvii–xcviii), wrote that 'possessing the necessary means of leisure she was able to carry out her work in a painstaking manner' and after marrying the entomologist Dr George Blundell Longstaff in 1906, she was still able to find time to continue.

Consequently, in response to another plea from Mrs Gray (10 April 1904), Bather had earlier provided the name of Jane Donald as the only possible person in the country who could work on her large collection of Gastropoda, but again expressed doubts because her previous work, although excellent, had been limited to a few genera (11 April 1904). He also commented that inducements for palaeontological work were not very great causing the few, who did undertake it for love, to be overburdened. Mrs Gray reported that Miss Donald was already working on her *Murchisonia* specimens. In fact, she had already published several other papers prior to this, all mentioning the Girvan material. This association was also maintained after her marriage and move south to Sussex and then on to various places in Surrey, in fact lasting until 1924, when Mrs Longstaff was

nearly 70. Many of her papers dealt solely with material in 'the magnificient Gray Collection'. Following Mrs Gray's death, she wrote:

> I shall often think of the pleasant visits I paid . . . she always gave me such a hearty welcome. . . . she has made the most wonderful collection . . . and being in the British Museum it forms a grand memorial of her.

Many of her Girvan taxa were only represented by a few specimens, most were crushed, some being founded on unique specimens, while some features that Jane Donald described now appear to be questionable (see Brookes Knight, 1941: 298).

Wheelton H. Hind (1860–1920)[35]. Apart from a letter of J. Horne's to Mrs Gray there is no evidence as to how Wheelton Hind became involved in describing the bivalves from Girvan. However, MacNair & Mort (1908: 138) mention his name in discussing the wide influence of John Young; since they also refer to Hind's palaeontological work elsewhere, and list his election as an Honorary member in 1909, it must be assumed that Hind had a close link with the Geological Society of Glasgow. Horne's letter (9 January 1908) informed Mrs Gray that Hind had virtually completed his examination of her Girvan material and suggested that the Royal Society of Edinburgh should publish the results. This idea was followed (Hind, 1910) and in his introduction, the author declared that:

> the task of . . . determining the fine series of lamellibranchs collected by Mrs Gray . . . has been no light one! The number of specimens which I could refer to no known species is comparatively large.

Hind went on to remark that he had been compelled to describe new taxa on single specimens.

The indifferent preservation of this material undoubtedly contributed to his difficulty, for comment by subsequent workers frequently alludes to this lack of features e.g. 'hinge not visible', 'really unrecognisable!', 'only a shape'. In retrospect, Hind was less successful in dealing with this Lower Palaeozoic material, and confused matters by ascribing specimens from quite different ages and horizons to the same species e.g. *Goniophora antiqua* (p. 539). Various letters in the Gray Correspondence relate to material that Dr Hind had borrowed, shortly before his death, for comparison with specimens in the BMNH and which Bather had to 'unearth' for return.

Thomas Henry Withers (1883–1953)[36]. Stearn (1981: 240) has briefly outlined the career of this 'jaunty cockney character', who after entering the museum as a boy attendant in 1898 and later given encouragement by Bather, became a world authority on the virtually neglected group of fossil barnacles. It took several years of negotiations by both Smith–Woodward and Bather before the Treasury sanctioned his appointment to the scientific staff as an Assistant in 1925.

Withers became another of Bather's later recommendations to Mrs Gray, although she had been made aware of his presence in 1915 when Bather had borrowed a specimen on Withers' behalf, as well as through replies by him to her letters whenever Bather was absent. A joint work on the Palaeozoic Cirripedes was interrupted by Withers' transfer to the Ministry of Munitions for the duration of the war (7 December 1916). Withers eventually completed a paper on the Ordovician specimens, naming a species *Lepidocoleus grayae* (1922), which prompted an appreciative note from Mrs Gray to which a hard-pressed chagrined Bather curtly replied (17 June 1922):

> Mr Withers, not being Deputy Keeper, can find plenty of time to do scientific work. I on the other hand can hardly get time at all, even by staying here all day!

Later, Withers recognition that these 'strange-stalked' fossils warranted the establishment of a new group, resulted in the publication of *Catalogue of the Machaeridia* (1926)[37]. This included further references to Gray material, (see p. 219). Subsequently, Withers completed his *Catalogue of Fossil Cirripedia*, which dealt with all the material held by the BMNH.

At the time the Gray Collection was purchased by the BMNH, Gregory[38] had borrowed the coral & bryozoan material, including the specimens described by Nicholson & Etheridge, but there is no evidence that he made any significant contribution with it before it was retrieved (8 March 1921). Much earlier, Ida Slater utilised specimens from Mrs Gray's collection for her monograph on the British Conulariae (1907)—another bizarre columnar fossil invertebrate—describing three new species and figuring examples of two other European species.

The eventual purchase of the Gray Collection overcame possible later problems from figured material being in private hands, that could have resulted from Mrs Gray's policy of encouraging specialists to undertake their research on her material and then insisting that it was returned to her. Although the collection was adequately labelled and the figured specimens marked, the fact that Mrs Gray did not always adopt a system of numbering the specimens, meant that describers and subsequent users had no means of referring to, or identifying particular specimens. Such practice would not have been condoned by present-day editors of geological publications, nor the International Commission of Zoological Nomenclature.

(f) Visitors

Apart from the specialists known to have worked on her material, there is documentary evidence for only two other scientific vistors[39]. The Gray/Bather correspondence reveals that Miss Elsa Warburg, the eminent Swedish trilobite worker, visited her in Edinburgh during 1913 (27 August 1913) but did not have time to go to Girvan. Another Girvan fossil collector, A. S. Alexander, provided a colourful account of a visit during 1904 in his autobiography (1939: 54):

> Quarrymen told me the aged widow might still be seen in early Spring sitting alone the whole day, breaking the hard limestone of Craighead, and searching with unwearying patience for fossils.
>
> As I longed to see her collection, I called at 59, George Street; was welcomed and ushered into her private 'sanctorum sanctorum', workshop, fossil store, and scientific library—all in one compact form. The one back window looked North and down on the grandly-wooded grey capital and over Forth waters to the green, sunny fields of Fife—a quiet suitable room for microscope work. Cases of specimens, or cabinets covered the greater part of available space of the other three walls. On the left, or West wide of the window was a small but strong wooden bench, with a powerful winch affixed in front. On the bench were rough specimens, hammers, chisels, and other geological tools for dressing the specimens. She pointed to the winch [? = vice] and said 'this has been of great service.' She opened a cabinet, fully taller than herself, and there appeared a tier of drawers of various depths from one inch in the higher to two or more inches in the lower. Beginning at the top she pulled out a draw and placed this on the broad window-sill which served as a table—there being a single chair in front which she requested me to occupy. The specimens in the drawer were arranged in rows. Each specimen, thinned and shaped, has a cardboard fastened on the lower surface. On the cardboard was written the name of the specimen, the name of the expert responsible for the naming, the locality where obtained, and other information or remarks anent. Some very special specimens had notes of experts, correspondence, illustrations, or publications in journals and science magazines. She directed my attention to special points of interest, and chatted in a free, homely, humble, modest

> way about the specimen shown. Certain localities I had searched, but failed to find fossiliferous beds, I inquired about. This she satisfactorily explained and rendered the reason. The burn in once case had altered its course and grass now overgrows the outcrop of the bed [Penkill, see note]. In another case, the locality should be searched at low tide as the bed is covered with water and sea-weed every tide. She seemed to know every curve and cranny of the Girvan district. We roamed in thought over the old haunts; and she expressed a hope to revisit and continue to search for trilobites or other. Drawer after drawer was placed thus on the window-sill for an hour without her resting or sitting. Finally, she pointed to another cabinet and explained that it contained the corals that my Professor Nicholson described in the *Monograph of the Silurian Fossils of Girvan*. We chatted to the door and gratefully bade good-bye, but to be held in memory while memory lasts.

There is a slight suspicion that this is not altogether an authentic account and could represent a compression of events, whether real or imagined, for Mrs Gray continued to visit Girvan most years and ocasionally went to London, even travelling to Europe in 1907. If the date is correct, only a few specialists had used the Gray Collection, at this stage, although the significance of her work had been recognised by an award of the Geological Society. Later (1 March 1914), Alexander requested Alice Gray for photographs of her mother for use in his book but before acceding to this she asked to see what he had written.

4. BIOGRAPHICAL ACCOUNT OF F. A. BATHER

W. D. Lang in tributes to his predecessor (1934)[40] provided adequate evidence of the multifarious interests and abilities of Francis Bather, in addition to recording the stages of his professional career. Bather's personal qualities and characteristics may have contributed to the difficulties in dealing with Mrs Gray and her material (see p. 198), for his intellect appears to have required a wide range of activity. W. N. Edwards, writing later (29 May 1937) to Alice Gray commented that: 'Dr. Bather was extremely able, but had far too many irons in the fire.' This phenomenal range of interests led to acknowledgement by his associates that he was an enjoyable companion; all accounts mention his kindly, witty and urbane nature, but although it is said he was beloved by his staff, there is a suggestion that Bather's occasional impishness, abruptness and precise fussiness caused problems. His trait for establishing exactly the correct procedure for any task[41], whether sketching, making tea, an omelette, or to write a sentence, arrange an index, or a collection, might be thoroughly commendable in theory for most museum work, yet, could be very irksome to those who had to endure such tuition, or comply with his succession of maxims, however pertinent and rewarding. Apparently, at times, the Geology Department had the atmosphere of a schoolroom! It is conceivable that the delays he experienced in processing specimens may have been the result of staff relationships, even though discipline at that period was more severe. Several references in surviving correspondence to mislaid specimens, or delays in dealing with other matters, also imply that Bather may have ignored his own standards, although Raymond (1953: 173)[42] had vouched that every needed specimen was readily accessible.

All biographies of Dr Bather refer to his devotion to research on fossil Echinodermata throughout his life, resulting in an acknowledged position as a world authority, particularly on the Crinoidea, the group in which he became especially interested. He made significant contributions to the understanding of the morphology of echinoderms

Dr F. A. Bather FRS, FGS (1863–1934). From BMNH staff photograph June 1924.

and, although not a field geologist, never lost sight of the effect of the environment, or the role of palaeoecology, nor the fact that the organisms he dealt with were once living animals. In some respects, Bather was an innovator of the current practice of applying biological concepts and evidence to fossil studies[43]. There is ample evidence of his willing assistance for contemporary workers; frequent letters from both Reed and Spencer seek Bather's valuable advice, help or comment on all aspects of their work. In addition to the involvement with Mrs Gray, Bather had much friendlier correspondence with other amateur collectors, notably W. R. Billings of Ottawa, who supplied most of the material described in Bather's various shorter papers. Such correspondence was often the result of Bather's immediate response to reports of new, or significant specimens, for he sought to borrow anything that might be of assistance to his studies of the Echinodermata.

Lang has commented on Bather's talent and leaning for writing reviews and popular articles—a task that he found more congenial since it enabled him to utilise a wide knowledge of literature, art and language. The length of Bather's scientific bibliography is adequate evidence of his prolific pen;[44] with more than 212 papers, half of these on Echinodermata, and more than half of those on the Crinoidea, several being significant long-lasting contributions; this list alone would refute any contention as to the neglect of his official duties! Other facets of Bather's aptitude for the written word was a willingness to act as editor, both official and un-asked, or his co-operation in the production of various journals. Finally, the evidence of countless index cards forming part of several different systems—one the Catalogue of Cystids and Crinoids that caused the reaction of Mrs Gray in 1911—survived for many years and their compilation must have occupied a considerable amount of his time[45].

His efforts to popularise geology and demonstrate the usefulness of palaeontology by exhibition, arose from a lifelong involvement with most aspects of museum administration. Bather's realisation of the importance of informative exhibits to interest every category of visitor, led to visits to most major museums in the world, in order to examine their technique and galleries. This concern for museum management & development, together with his flair for writing, also led Bather to produce a defence against the philistine political criticism of museums during the period of the First World War. In many respects, Bather might be considered the most learned and versatile of those appointed to the position of Keeper of Geology, being familiar with most of the different aspects entailed in that office. Yet, his significant influence to the curation and administration of the BMNH was achieved before his appointment to that post (in 1924), which he was only to hold for four years[46]. The situation became even more difficult once he was made President of the Geological Society of London in 1926, which imposed further arduous duties upon such a responsible and dedicated individual. Although the cause of Dr Bather's death in 1934 could be attributed to an illness arising from his participation in a local dramatic production that winter, it was generally believed that his health had suffered during these appointments and contributed to the situation, as well as limiting his research output after retirement.

There is evidence that Bather attended almost every annual conference of the Museums Association, participating as an able and witty debater, or a capable chairman. He was keen on amateur dramatics; Bather is also known to have been a zealous champion for the cause of Woman's Suffrage (very probably at the period Mrs Gray was berating him for not dealing with her crinoids!); and also very involved with local matters in the area of Wimbledon where he lived[47]. Two letters[48] from Bather's home librarian and secretary mention other occupations. These ranged from the compilation of an index to the puns by Shakespeare, to the more practical tasks of binding the books in his library and establishing a Private Press ['FABO'] to publish specialized reference works on echinoderms.

Throughout his correspondence and publications, Dr Bather complained that his 'official duties' occupied most of his time and hindered scientific work, but our re-appraisal suggests that it was very likely the range and volume of his interests and activities that impeded progress. In our view, the papers he did accomplish, together with his numerous professional achievements and official museum administrative function, demonstrate that Francis Bather fulfilled every responsibility required by each of his roles. The understandable chiding of an enthusiastic elderly Scottish gentlewoman, although justified in part, was the result of her own anxiety and lack of understanding about the environment of her eminent professional collaborator. In fact, the many facets of Bather's life and work, as well as the hints of his acquaintances concerning 'that Lonely Intelligence' who had an impish personality, indicate that he probably warrants a more detailed biography.

5. THE CORRESPONDENCE BETWEEN MRS ELIZABETH GRAY AND DR F. A. BATHER

The correspondence between Dr Bather and Mrs Elizabeth Gray spans a period of over thirty years, from October 1892 until her death in February 1924. It forms seventy percent of the letters forming the two volumes of the Gray Correspondence and is primarily concerned with the identification, borrowing and return of her numerous fossil specimens belonging to the phylum Echinodermata in which Bather specialised. However,

BRITISH MUSEUM (NATURAL HISTORY),
CROMWELL ROAD,
LONDON: S.W.

30 Oct. 1892.

Dear Madam,

Having this morning received your address from my friend Mr. J. G. Goodchild, I beg to inform you that I should find much pleasure and profit in the examination of the Ordovician & Silurian Echinoderms in your collection, and that I should be extremely obliged if you of

The letter that began the Bather – Gray correspondence: Dr Bather's request to borrow the Gray material written on 3 October 1892.

that statement although broadly summarising the theme does not convey anything of the difficult relationship produced by two such differently motivated people. Their dissimilar environments, interests and responsibilities caused considerable friction and the letters reveal a pattern of highs and lows in their working relationship, largely arising from mis-understandings over comments and intentions. Although Dr Bather partly understood Mrs Gray's wish to have various specialists examine and describe the material in her collection, he had no conception that this was almost an obsession. Nor did he realise that the need to relinquish her cherished specimens to achieve this caused her considerable anxiety. In the circumstances, her patient forbearance of his, to her, apparently dilatory approach in dealing with '*her fossils*' can be appreciated. Equally her own narrow outlook and selfish preoccupation led to her failure to fully realise that someone in Bather's position[49]—an administrative scientist at an internationaly-renowned museum—would have many other duties and calls on his time. Although, in part, this complete lack of understanding by Mrs Gray can be excused by her age and social background; while on Bather's side, Mrs Gray herself had encouraged him to examine much of the material.

The tone of their correspondence is very polite, but although they exchanged greetings and enquired after each others families, it cannot be considered really friendly. In fact, the frequency of the letters reflects the current state of their 'business' relationship; only occurring at close intervals during a period of difficulty, or on those occasions when Mrs Gray's concern prompts her to seek drastic remedies to achieve her life-long aims. Such alarums are in contrast to her more normal procedure of making brief periodic enquiries as to the progress that Bather might have made with any of the main projects he had undertaken. The letters convey the full nature of their reluctant collaboration and as W. D. Lang has remarked (12 February 1938): 'the complete sequence ... makes an interesting story'.

It began with Bather requesting the loan of the Ordovician and Silurian echinoderms in the Gray collection (3 October 1892) and commenting that he: 'would find much pleasure and profit in their examination'. Mrs Gray responded immediately: 'Thank you for your kindness in offering to examine the Echinoderms in my collection', but was unable to despatch the material for several weeks owing to illness. Bather within weeks of having asked for this material wrote (20 October 1892) that he had very little time available owing to the approach of winter and the fewer hours of suitable daylight when such private work could be accomplished. Two years later, Mrs Gray offers new crinoid material for him to study, refers to her fossils and comments that she would be glad to hear from him. Bather replied promptly, explaining that for almost all the intervening time he had been unable to work, owing to an eye problem, but re-assured her that the specimens were quite safe. In fact, during that period, Bather had taken a voyage to Japan to recuperate and had also been to Scandinavia where he had met his future wife. Next, presumably in an attempt to gain information, Mrs Gray used the pretext of listing all her fossils from Girvan to make another request (17 May 1896) about the specimens with Bather; which brought an immediate reply that he had not the time to deal with them and since most were only fragments of crinoid stems, he would not venture to name them. Thus the pattern of enquiry from Mrs Gray and the plea of 'too little time' from Bather was established almost from the outset. The real practical problem of adequate light in which to examine the specimens occurred again when Mrs Gray supplied specimens of a new Pleurocystid in the early months of 1899[50].

In March 1900, a few months after J. W. Gregory had declined to undertake the description of Mrs Gray's starfish, Bather wrote to ask her permission to send casts to Dr Schuchert at Yale, since he had taken over responsibility for the Museum's starfish collections following Gregory's departure for Australia. At the same time, Bather informed her that he had begun a Catalogue of all Cystidea and Crinoidea and would

work systematically through her collection (and many others), returning specimens when they had been finished with. Mrs Gray took the opportunity and sent all the specimens of starfish that she had, having concluded from his remarks that Bather had also taken up their study. Although retaining this excellent new material, Bather pointed out she was mistaken and asked: 'please remember, at present, my whole energies are—or should be—devoted to the Cystidea?' That summer, Mrs Gray responded by sending her finds of cystids and crinoids, asking that the latter should be placed with the others still with Bather 'in the hope that they may ere long find an interpreter!' To help her understanding of these cystids, Bather referred Mrs Gray to his contribution on the Echinodermata in Lankester's *Treatise on Zoology*, which had been his principal task during that period.

Over the next few years, it would appear that there were only brief exchanges between them. In January 1901, prompted by a request for a list of her fossils from the Geological Survey to update their Memoir, Mrs Gray used this as an excuse to spur Bather, who responded by suggesting that the best course was for him to update the Survey list himself as conditions at the BMNH '*were getting much worse, not better as he had hoped!*' The following year, with F. R. C. Reed reporting that he had nearly finished dealing with her trilobites, Mrs Gray was anxious to learn whether Bather had made any progress with his examination of her Crinoids—(and starfishes!), stating that she also wished to put her collection in order. Bather, having then just been appointed Assistant Keeper, pleaded that his official duties did not allow time for private work, but promised to return everything that was not of immediate use.

It was at this time that Bather had become fully involved with other facets of museum work, introducing his ideas on curatorial practice into the Department of Geology, establishing himself as an authority on zoological nomenclature, and eventually with his active interest in the developing Museums Association, becoming that organisation's President in 1903. Apparently, after explaining that pressure of work prevented him from dealing with her material,—much of it in fact stemming from these additional interests, Bather decided that the best course as Mrs Gray was so anxious about her specimens, was to return all the Echinoderms and this was done in September 1903. During 1904, Mrs Gray sought Bather's help over finding a specialist to deal with her gastropods, but it transpired that Jane Donald, who Bather suggested as the only possible person, was already working on part of the Gray collection. In 1906, Mrs Gray's annual collecting trip to Girvan produced two possibly new cystids, which she asked him to examine and in her single letter that year, added the inevitable enquiry about those he already had. Bather replied at once asking her to wait as he wanted to complete a long-term research project and avoid all other interruptions. Presumably, this was his *Triassic Echinoderms of Bakony* (1909), for in its introduction Bather indicated that a long time had elapsed between his receiving the fossils (in 1901, 1902 & 1903) and the completion of that memoir. Over this same period Bather was also occupied in compiling the section on the Department of Geology for A. S. Woodward's[51] contribution to the museum's *History of the Collections* (1906), but he would not have described this as a research project.

In July of 1907, at the age of 76, Mrs Gray visited a friend in Dresden and she also asked Bather to provide an introduction so that she could visit Prague at the same time, in order to examine Barrande's collection in the Narodni Muzeum. On her return a month later, and after leaving material at the BMNH on her way home, she enquired about a specimen lent to Bather in 1899 that had not been returned to her, but with which she wished to make some comparison. Bather only replied after she had written again that October, informing him of the new season's fossil haul, when he encouraged her to preserve every fragment of the various echinoid-like fossils she has found in the Starfish Bed[52].

Their joint interest in the Pelmatozoan Cystids and other bizarre Echinodermata[53],

appears to have fostered an increase in her activity and their communication, which persisted until its culmination in the memoir *Caradocian Cystidea from Girvan* that Bather eventually produced in 1913. This episode opens with Mrs Gray musing (21 November 1908): 'I sometimes wonder if you have had time to do anything with the fossils that I left with you ...' and Bather replying with the dramatic opening (1 December 1908)[54]: 'I always see with fear and trembling an envelope addressed by you'. Both in that letter, and in his introduction to the cystid memoir, Bather explained that his apparent procrastination was merely the result of other work preventing any real progress: 'if only people would stop sending me all sorts of other fossils, I should have some chance of getting on!'[55] and that it was necessary to study allied species and genera before he could proceed with Mrs Gray's Girvan material. He expressed his gratitude to her with the opening sentence of the memoir and underlined his indebtedness for allowing her specimens to remain in his hands for such a lengthy period. Mrs Gray's keen interest in the class may be explained by her comment: 'every time I go to Girvan ... I find specimens new to my collection ...' for it was certainly this that induced her to borrow Jaeckel's work on[56] Cystideans on several occasions. Although she apparently enjoyed looking through that book (17 December 1910), Mrs Gray later conceded 'it was to no great avail in determining her own material'.

Mrs Gray's preoccupation with the cystids is apparent from her letters. Bather mentioned that he was compiling a catalogue of all the cystids in the British Museum's collection (25 November 1910); 'doing all he can on the Cystidea' by taking his holiday to do so and working at home (17 December 1910). The first letter brought the comment from Mrs Gray (1 December 1910): 'Of course, if you are not likely to be able to take up my cystideans ... I need hardly continue to send specimens to you!' She explained that being 'a long way past the allotted three score years and ten' she was anxious to see work on her British fossils completed and reminded Bather that she had been sending him fossils for 18 years. This was followed by a second letter (29 December 1910) enquiring whether Bather intended working on her material as well as that of the BM?; was that collection very large? had she omitted to see anything important? was there a collection as large as her own, or with a greater variety of species? Mrs Gray continued by expressing her goal:

> I know that you are the authority, but I am so anxious to know what mine are, & which are new that I would willingly put them into the hands of any competent worker, who would undertake to examine them at once! Every other group in my collection has proved to contain **new** material.

These continual enquiries ought to have fore-warned Bather of a potential crisis. However, he simply replied (2 January 1911) by describing the nature of the catalogue he was compiling but compounded his error by inadvertently mentioning that, in common with all other British Museum Catalogues, only their own material would be figured. Misguidedly, by way of appeasing Mrs Gray, he suggested that descriptions of species in the Gray Collection could be included in this Catalogue. His preoccupation with the catalogue and in providing a straightforward answer to all her questions, caused Bather to omit mentioning that his descriptive manuscript on the cystids was in an advanced state of completion—that might have mollified her a little. Within three weeks, she had acted and made other arrangements for her 'beloved specimens' and notified Bather (21 January 1911) that he should return them all as Mr Reed 'although diffident about working on a group upon which you are the authority' was prepared to do so that summer. Mrs Gray had effected the very situation outlined in her earlier letter and though, in her opinion, 'the description will lack ... high distinction ... I feel Mr Reed will do excellent work'.

It was a complete and most unpleasant surprise to Dr Bather, particularly as he felt he was taking a great deal of trouble over helping her. No doubt it was this event, more than any other subsequent occasion, that led to his accurate and colourful description of his position, or that of any specialist, at the British Museum:

> A palaeontologist at the BM is often envied, much as Dionysius of Syracuse was envied by Damocles. If any Damocles were to take my place he would see, it is true, a rich feast of Cystids and Crinoids laid before him. But the chains of Office would perpetually hinder him from feeding, and every day he would dread the fall of the sword in the shape of a peremptory letter demanding the immediate return of some necessary specimens[57].

Replying immediately (23 January 1911), Bather gave a detailed analysis of the situation over the cystids and pointed out that although 'Mr Cowper Reed will begin work on them in the summer, ... he had begun work Already!' He acknowledged that perhaps she had not appreciated the hours of work that had been spent preparing specimens, or making notes and pointed out that 'some of the more curious among them have been perpetually in my mind's eye' and that he had been accumulating material from all parts of the world for the necessary comparisons. Consequently, he would still need to study her material, whoever described it, since he was compelled to complete the task. Although Mrs Gray apologised for her misunderstanding over his original letter and acknowledged Bather's need of her material, she was adamant about her request: 'Let me have my cystids soon—it will take me some time to look them over'—she even reminded him of a single specimen left at the BM in 1907. She hoped he would sympathise with her great desire to know just what her collection contained and would endure the step she had taken with patience. She admitted (28 January 1911) that she was quite unaware of the time he had spent working on them for: 'Indeed, I sometimes wondered if you thought them as interesting as I did.'

Events took their course and produced what might have been a memorable confrontation between Bather and Reed at the British Museum on 30th January, which resulted in Reed's prudent withdrawal following his recognition of the considerable amount of work that Bather had already accomplished. Apart from this, Bather was in a very strong position, for he had a good working relationship with Reed, who was dependent upon him for help with the numerous descriptive projects undertaken for other bodies with which Reed augmented his university income. In a friendly letter[58] to Bather (3 February 1911), Reed explained that he had pointed out to Mrs Gray that 'it is impossible for me to deal with her collection' since he felt that under existing circumstances 'she was [not] free to offer me the work'. However, he emphasized to Bather that 'mere reference to, or description of her material would not satisfy' Mrs Gray since 'it is independent treatment of her collection with figures which she requires'. Although appreciating Bather's special difficulties, Reed advised him to propose a smooth and rapid course for dealing with the material, although he realised such 'work cannot be hurried'.

Letters from the two protagonists crossed giving their interpretation of Reed's conclusions. With Bather emphasizing (6 February 1911) the amount of difficult time-consuming work involved in the preparation of such fossils (often between 60–120 hours per specimen) but to allay Mrs Gray's fears of further delay, stating that progress should now be quicker since most of this work had now been done. She, in turn (6 February 1911), confirmed Reed's opinion, and sought to defend her action as protection of her material from its likely fate of becoming a mere mention in a BM Catalogue, unrepresented and undignified by the illustration it deserved!

This did not end the issue between them, it dragged on for several months, reached other identical crises as they tried to resolve their quite different objectives. Both plainly

stated their opposing views, Mrs Gray insisting on the early publication of any work on 'my Cystids' and that it should preferably be in the form of a Monograph. Bather on the other hand, (15 Febuary 1911) felt that this was impractical and proposed the gradual treatment of her fossils genus by genus and publication of their descriptions in a series of papers. In that way, she would have the assurance of seeing her fossils dealt with and returned to her as they were completed and he would have the satisfaction of seeing the plates were published as they were produced. He felt that monographic treatment was unsuitable for such a difficult group of fossils and that the difficulties and prohibitive cost of ensuring satisfactory and adequate illustration made it even more so.

Mrs Gray at one point (19 February 1911) considered that their views on publication were so widely divergent 'that if it were carried out to the satisfaction of one, it could only be to the dis-satisfaction of the other' and again called for the return of all her specimens. In order to clarify matters further, Bather had explained (15 Febuary 1911) that he had originally intended to utilise the Gray material 'to the best advantage of science', but that he was not in a position to undertake a complete monograph on the Cystidea, nor was he prepared to produce an inferior work. Despite having spent considerable time dealing with the material and feeling that he had made enough concessions, Bather began to arrange the re-packing of the cystid specimens for their return to Edinburgh.

Very likely, Mrs Gray must have had second thoughts, realising that she would probably never obtain the descriptions she so badly wanted since Bather was the only person, who could provide them. The following day, as a conciliatory gesture, she sent a token note suggesting that Bather might consider offering a paper to the Royal Society of Edinburgh. Somehow Dr Horne of the Geological Survey became involved and acted as a mediator. He informed Bather that Mrs Gray was sending all her cystid material to London for him to assess the size of the task involved in their description and then suggest a possible time for its completion. After the allotted month, Bather duly made his report (8 April 1911) and agreed to undertake the preparation of a memoir restricted to the Starfish Bed Cystidea within a year, despite his reluctance previously to commit himself on this point of completion, but would still not make any definite promise about publication dates. He also pointed out that his own position could be made much easier, if a selection of the material was presented to the BMNH, thereby enabling him to work upon the task officially. Without openly agreeing to all these proposals, Mrs Gray informed Bather that Dr Horne, as editor, would apply for a grant to publish the plates if he intended to submit the memoir to the Royal Society of Edinburgh. Bather replied that he intended to do so and Mrs Gray expressed her pleasure that the work was to be published by a Scottish Society. The following year, despite numerous distractions and tasks during the preceding months, Bather presented a paper, as promised, at a meeting of the Edinburgh Royal Society on 13 May 1912. By accident, Mrs Gray was unaware of the meeting and had been at Girvan that week. However, as Bather pointed out to her, the memoir itself still required to be 'knocked into shape' and this would take considerable time; it was eventually received for publication in March 1913.

Having achieved her first objective, Mrs Gray (16 November 1912) immediately began to bother Bather about her crinoids and other echinoderm taxa, particularly as she was continuing to discover further material. After expressing her gratitude for his work on the cystids she continually tried to needle him, in a succession of letters during the winter months of the following years, into producing another monograph on the Girvan crinoids. One letter (28 November 1912) probably demonstrates her great anxiety:

> On thinking it over, I seem only to feel that I am likely to be deprived . . . of seeing the description of my Crinoids, which were first sent to you—at your request! in 1892 . . . the cystids followed in 1899. Surely you have no other material with a claim prior to mine!

At first, still trying to complete that on the cystids, Bather is compelled to use all available time to fulfil his current commitment and attempted to dissuade her by explaining (19 November 1912) that he had many other pressing tasks once the cystids had been 'got rid of'. After outlining his working methods, Bather endeavoured to appease her further, by explaining that the bulk of the crinoids had been provisionally examined and that he intended dealing with them in conjunction with his official task of compiling a complete catalogue. Upon completing the Cystid memoir Bather wrote (19 March 1913): '... if you have any idea of the work entailed ... you can understand I am in very urgent need of ... the first holiday since starting the task.' but to ease her mind he reported that the preliminary work on her edioasteroids had also been completed.

Having reached her 82nd birthday Mrs Gray responded (27 March 1913) with the questions:

> Can none of your ... research be laid aside ... to let me have the satisfaction of knowing after many years of patient waiting ... the result of my 50 years work? Is there anyone in the wide world who can do it? The other people ... making demands on your time are probably much younger ... and can ... afford to wait!

At the end of that summer, this is followed by the even more plaintive cry (27 August 1913):

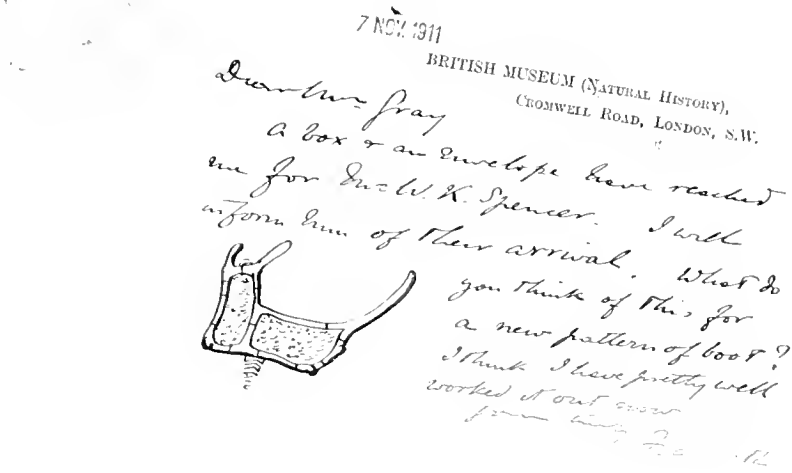
> I cannot refrain from writing again to ask if you ... see your way to working on my crinoids? ... my reason for doing so always increases ... In the wakeful hours of the night, I often wonder if I am ever to see my fossils again and think that I cannot let them remain away from me much longer.

Bather fully sympathized with Mrs Gray (29 August 1912) and understood her anxiety, but could only reasssure her that he was as equally anxious to proceed himself, while emphasizing that the Palaeozoic echinoderms presented exceptional difficulties and pointing out that it was necessary to consider her fossils together with others, for simply describing 'what is new' as she requested, would scarcely produce a work intelligible on its own. He ended by stating that: 'your echinoderms occupy a leading place among the things I have set myself to do'. Later, that year, most of Mrs Gray's cystid material was returned to her, an act which caused Bather a month of further problems, following his recognition that several specimens belonged to other taxa upon which he was still working and had led to their retention. His comment to Mrs Gray that she would find 'a few missing' on this account, simply did not register with her. Much to Bather's consternation, the possessor of that phenomenal memory was soon demanding the return of individual missing specimens that she could recall. Although Museum staff had numbered and labelled all the cystids that had been returned, there was no method of recognising particular original specimens

> I really do not know what I am to do ...
> I don't in the least know how you manage to identify particular specimens
> ... but it is certainly impossible for me to do so ...

are some of Bather's responses, but fortunately for both of them matters were soon rectified. An identical situation occurred the following year, after Bather had returned other specimens and Mrs Gray expected to find a particular example showing both a crinoid arm and a gastropod, known to the family as the 'hat and feather'.

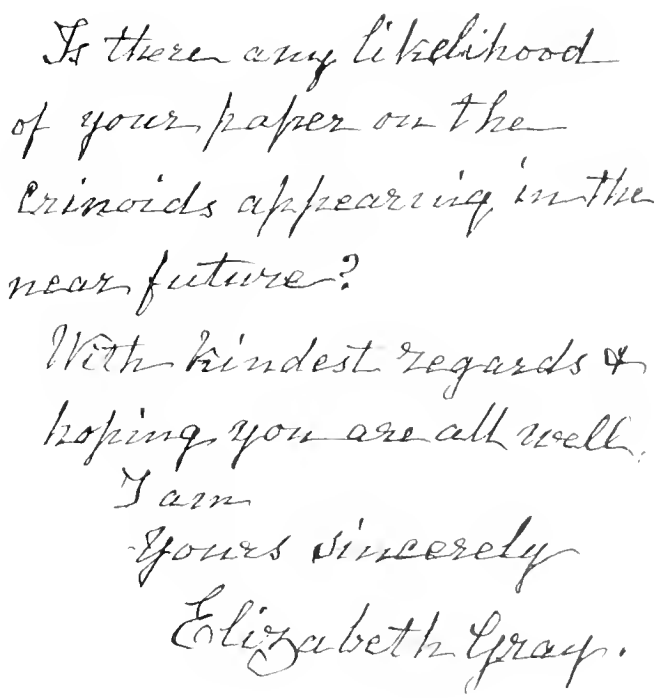
Soon afterwards, the First World War caused various problems as many activities of the Museum and its Departments had to be suspended. Bather completed a series of



Terminology: Mrs Gray's sketch of 'the hat & feather' specimen see her letter of 2 August 1915 (p. 201); Bather's postcard concerning the 'boot' dated 7 Nov. 1911 (p. 218).

papers on the edrioasteroids, which he also published privately together as a book, and this work pleased Mrs Gray to some extent (14 January 1915), although he was never to produce the intended monograph on her crinoid material. At intervals throughout the remainder of her life, Mrs Gray's letters ask whether there has been any progress and Bather always pleaded pressure of other research, his daily routine of official duties, or else too few staff. During the war, this became true and on several occasions Mrs Gray considered requesting the return of her specimens (30 January 1915): 'I feel that I cannot allow my specimens to remain out of my possession for an indefinite period, and at times I feel very anxious about their safety.'

In his history of the Natural History Museum, Stearn (1981: 106–109) has described the difficulties caused by the Government of the time, particularly the threat in January 1918 when it was proposed to take over both museums at Bloomsbury and South Kensington to provide additional accommodation for use as Government offices. Fortunately, this was averted by representations from various scientific and professional societies acting together with the 'media' of that period[59]. Naturally, since in response to


Is there any likelihood
of your paper on the
Crinoids appearing in the
near future?
With kindest regards &
hoping you are all well.
I am
Yours Sincerely
Elizabeth Gray.

Extracts from Mrs Gray's letter to Dr Bather concerning her collection, 22 November 1923 [aged 92].

her usual enquiry, Bather had reported (7 December 1916) that in the circumstances: 'not much progress is being made with scientific work and your specimens have to share the fate of . . . others', Mrs Gray became very concerned. However, by the time that she had decided to do anything, the Government had abandoned their attack and Bather was able to report (10 January 1918) that staff had been engaged to remove specimens to basement storage and re-assure her that: 'your specimens will be next to what we consider the most valuable fossil in the world[60]'.

The war also affected[61] the normal scientific interchange of reference material. At one period, Bather (4 Febuary 1915) explained to Mrs Gray that the reluctance of the Americans to send specimens across the Atlantic had prevented him from making further progress with his crinoid research. A few months later, on behalf of Professor Schuchert at Yale, Bather requested the loan of a rare coral of hers from Girvan (16 October 1915). After clarifying matters and only agreeing to this after imposing the condition that everything should be returned to her afterwards, Mrs Gray commented that: 'as it now seems to be safe for my corals to cross the Atlantic, I hope the crinoids you require are being sent to you!' Much earlier, she had vanquished another of Bather's excuses when in response to his argument that expenditure resulting from the war made it more difficult for him to undertake 'unpaid private work', she had riposted with the retort that for 55 years she had worked as an 'unpaid fossil collector!'

The crinoid episode dragged on; Mrs Gray adopted the tactic of requesting all her new finds to be returned immediately after their preliminary examination and identification

(27 December 1912): 'as I have not seen any of my crinoids for many years'. She also tried to get Bather to inform her whether any of the specimens in her main collection might be new species (17 June 1922). The last word might be said to have gone to Bather, for the 'new finds' included examples of the Crinoid *Herpetocrinus*, which he reminded her (23 January 1923):

> 'my first letter asked to lend specimens of this genus . . . unfortunately, for my purpose, you sent me so much else,—for which I did not ask—, that I have never been able to complete my paper!'

In some respects, it is surprising that this research was not completed, for the majority of Bather's scientific papers dealt with crinoids and one can only assume that he was never sufficiently satisfied with his results. Yet, Mrs Gray's 'hounding' over the Girvan crinoids was continued after her death in 1924, by her daughter Alice (see 23 February 1925), even though by then most of the material really belonged to the BMNH.

6. ACQUISITION OF THE VARIOUS GRAY COLLECTIONS

(i) The Original collections

The material from the earliest Gray Collection accumulated by both Elizabeth and Robert Gray as well as her father Thomas Anderson, was presented to the Hunterian Museum in 1866. As discussed above, it formed the basis of several short papers, or was used in other ways by the Natural History Society of Glasgow. The interest this aroused led to the Gray family's pre-occupation with fossil collecting in the Girvan area on behalf of known and unknown specialists and for the science in general. Donations of various geological specimens were subsequently made to the Hunterian[62].

Letters of R. H. Traquair provide details of the transactions preceding the purchase of a representative collection by the Royal Scottish Museum in 1889. It would appear that Mrs Gray had offered a selection of her duplicates to Traquair for £60, but in a reply (21 January 1889) he declined with 'unfeigned regret' since he could not recommend paying 'so high a price for them'. Her immediate response was to write back to Traquair and ask just what figure he would be prepared to pay? In an apologetic letter several months later (24 May 1889), Dr Traquair explained his 'extreme discomfort of finding myself involved in a dispute with a friend about money'. The long delay before replying was solely due to his putting off the disagreeable duty of making an offer 'which from its smallness' might be considered offensive to her. In quoting a figure of £35, in his view a quite liberal price, Traquair declared that it was the highest he would acquiesce to and if this did not suit the matter must be dropped. This ultimatum led to general agreement, but in a subsequent letter (29 May 1889) Traquair mentioned that he had no objection to any 'un-necessary duplicates' being excluded from the purchase and being returned to Mrs Gray. This condition was apparently the lady's compromise in settling for the sum offered.

Much later (21 Febuary 1920) when referring to the matter, Mrs Gray stated that she had sold 750 specimens for the sum of £35. She also revealed that a year later [*c.* 1890?] 1100 specimens had also been sold to the Geological Survey for £50 and commented that:

> these small collections contained . . . neither types nor figured specimens, nor my best specimens, nor any of the rare species . . . and they were representative of my collection only as it was 30 years ago

Several collections of Girvan fossils were presented to the Sedgwick Museum, Cambridge by Mrs Gray between 1907 and 1910, and were identified by F. R. C. Reed.

A letter to Mrs Gray from D'Arcy Thompson at St Andrews (23 Febuary 1921), mentions the donation of various items at this period. But, his particular reference to a small collection of graptolites and its association with Lapworth marking them as a very appropriate accession for St Andrews, raises an element of uncertainty as to their source. However, his final comment: 'You have given away many things in your time, and I know perfectly well that you will send us nothing which is not worth having . . .' suggests that they are merely Gray specimens Lapworth had used, or examples of species he had originally described.

After her negotiations with the Royal Scottish Museum, it is possible that Elizabeth Gray had turned to another friend when considering further disposal. A letter from Lapworth to her (12 April 1914) referring to the scientific reliability of her material, regrets that his Department at Birmingham University 'living from hand to mouth' could not afford a complete set.

Shortly after (20 May 1914), Mrs Gray wrote to Smith-Woodward at the BMNH, who had earlier expressed an interest:

> I write to inform you that I have decided to offer for sale the Trilobites in my collection . . . It consists of 157 different species . . . and included the types of 53 new species . . . described by Nicholson & Etheridge (1878) and Mr F. R. C. Reed (1903–1906, 1914). . . . my collection represents in a very complete form the Trilobites of the Girvan District and has therefore a special value!

This time after her experience with the RSM, Edinburgh from quoting a price, Mrs Gray decided to seek an offer from the British Museum. Inevitably their response was that they were unable to fix the price and asked her to name a figure for consideration. She in turn, felt unqualified to do so and duly sought Lapworth's help (1 June 1914). He hesitated, but a week later, after having fully investigated the matter, suggested a figure of £300 based on a range of £250–£500. He had arrived at this amount based on the recent purchase of the Ketley Collection for a similar sum and various sales of specimens from the Dudley area, including one collection of more that a thousand specimens that was bought by the Natural History Museum for £550. However, in a detailed explanation (10 June 1914) he stressed that although the Girvan specimens were less beautiful and more incomplete, her collection contained more new species.

Presumably, this valuation satisfied Mrs Gray, for the next day (12 June 1914) she wrote back to Smith-Woodward mentioning that she had consulted a knowledgeable friend and offered the trilobites for £300. Her letter is annotated 'price much too high—delay until Autumn' and it would appear that it was then intended to refer the matter to the Trustees. In a reply to this refusal, Mrs Gray commented (29 July 1914) that she had consulted two specialists and still believed the price was moderate. The matter languished until she reminded Smith-Woodward (21 January 1915), who responded (2 February)[63] by an inferred reply that a more comprehensive offer of the whole collection would be preferred at a later date. This was acknowledged (5 February 1914) by everyone in the Gray family, who all wanted the British Museum to purchase the entire collection, as the best way of dealing with the Girvan fossils.

Within a month or so of the war ending, Mrs Gray wrote (21 December 1918): asking whether the British Museum still wished to purchase her collection. She expected a good price, as apart from its being representative of the difficult Girvan District, she maintained it was unique having been examined by various specialists, who had then described her material. Her letter ended: 'In view of my advance age (I am in my 87th year), I would like to have the disposal of my collection settled.' and had begun: 'the

59 George Street
Edinburgh.
20th May 1914.

Dear Dr Smith-Woodward,

I write to inform you that I have decided to offer for sale the Trilobites in my Collection. This collection contains about 1100 specimens; each specimen with-

59 George Street.
Edinburgh.
29th June 1914.

Dear Dr Smith Woodward,

I have to acknowledge having received your letter with reference to Dr Bather's absence. I regret to note that you think the price I have fixed for the Trilobites is too high.

Letters concerning the sale of the Gray Collection to Dr Smith-Woodward (see pp. 204–209). Offer to sell trilobites, 20 May 1914. Comment on price offered, 29 July 1914.

British Museum ... is where I should like it to be.' Smith–Woodward asked (1 January 1919) for lists and separate estimates of the value of each group exclaiming that: 'we are very anxious to acquire your collection if reasonable terms can be arranged, as soon as we have funds again.'

A year passed as each side clarified the position and Mrs Gray produced the requested lists and the BMNH asserted that they wanted the total collection including all duplicates. This preoccupation with numbers left considerable margin for adjustment, particularly as the nature of the material and the inclusion of unseen duplicates left uncertainty. In Febuary 1920, Smith–Woodward, after consulting Bather again, asked Mrs Gray to provide her value for each group. She, understandably explained that with her limited experience it was not possible for her to price the collection in sections. Her letter (21 February 1920) continued:

> In disposing of ... my material, I feel that I may reasonably look for a price that will in some measure repay me for my life's work. ... I feel that I can price my collection only as a whole ... and that I should like to get £2,500 for it. ... I know that the Gray Collection has for many years been regarded as a special collection and one of importance. ... therefore ... for such a special collection I am justified in asking a special price!

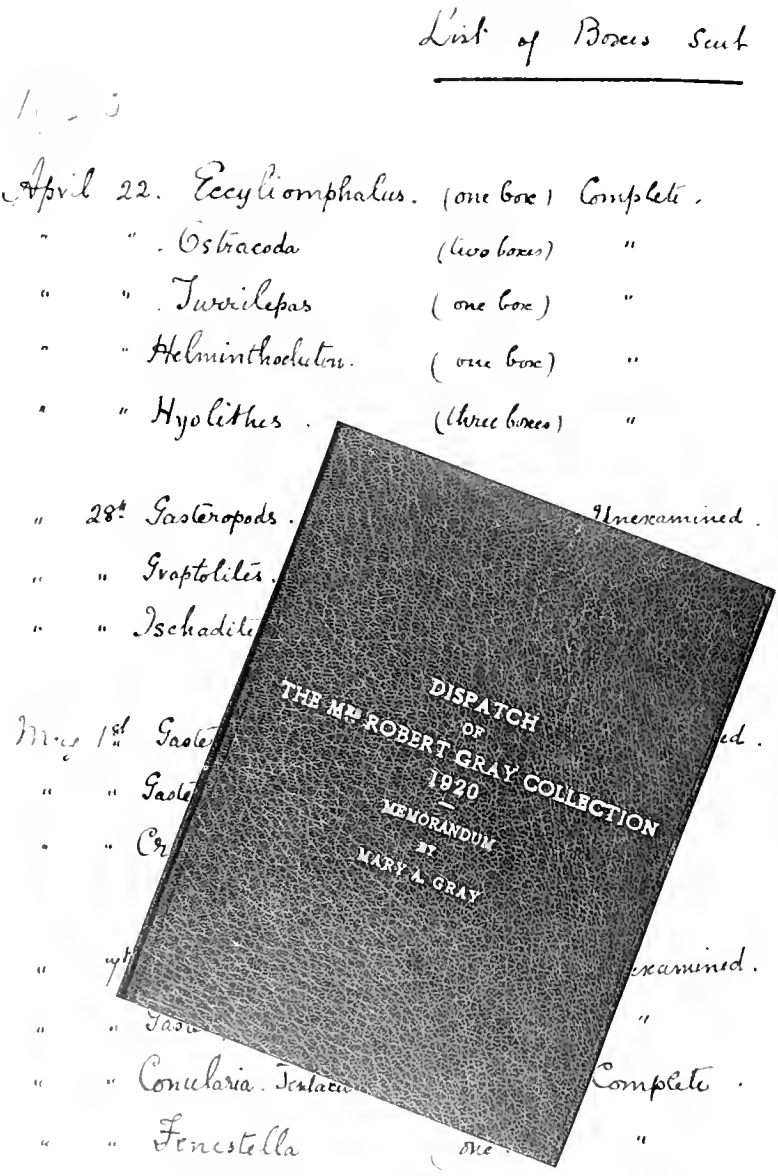
A surviving internal memorandum (27 February), compiled by Dr Bather[64], outlines the basis for pricing Mrs Gray's collection and also emphasized that some allowance needed to be made for potential types. After making due allowances for counterparts, material on loan and applying his own unit figures to Mrs Gray's lists, Bather calculated a figure of £1750; to ensure that every aspect was covered, including the possibility of further material, he suggested the value of the whole collection might be estimated at £2000. Smith–Woodward informed Mrs Gray of this figure (3 March) and enlarged on the various matters that had been taken into account such as the rarity of some groups, the lower value and fragmentary nature of others. He emphasized that Dr Bather had added a liberal allowance to compensate for any failure to recognise important material, or any mistake over numbers. Finally, in an effort to re-assure Mrs Gray that the figure was in accord with established practice, he misguidedly explained that it corresponded with 'our usual rate' and with her previous sales to Edinburgh. By way of encouragement, Smith–Woodward suggested that it should be possible for the Museum to make the first of the three agreed part payments within the month.

Mrs Gray replied immediately with a lengthy letter (6 March 1920), underlining her own view that the Gray Collection was a special collection of considerable scientific importance and cited figures that she felt demonstrated its greater frequency of 'new species'. To justify her opinion she quoted comments made by several users as to its special merits in comparison with other Museum collections. Understandably, she seized upon the unwitting remarks made by Smith–Woodward and exclaimed:

> I feel that I should like it to be valued at a somewhat higher rate that your 'usual rate' and that at which I sold **small** collections thirty years ago!

She concluded with the comment that: 'a collection such as mine can never be repeated'. Althought convinced of her own valuation, in the 'interests of Science', Mrs Gray agreed to compromise on a figure of £2250[65].

In an effort to appease all parties and complete the transaction, Bather was prepared to add a further comment to her letter acknowledging that his original estimate might be wrong in the light of Mrs Gray's fresh lists and recommending the agreement of the Trustees to her figure. Smith–Woodward informed her of this decision (8 March) and



The memorandum book containing details of the despatch of the Gray Collection to the BMNH in 1920 superimposed over a page of its contents.

asked for a selection of the 'choicest things' to tempt the Trustees. On the 29 March, he was able to write that the purchase had been agreed and payment would be made during

the next four years, but that he intended to arrange that most of the sum would be paid within two.

Numerous letters over the next few years deal with a succession of problems and details concerning the despatch and contents of the Gray collection. By May, the first third of the collection had reached the Museum, entitling her to the first payment of £850 and Bather confirmed that well over this quota had been received. The major part of the collection was installed at South Kensington within the year and only the various loans to other specialists remained to be gathered in (see letter 26 October 1921). Inevitably, the constant re-use of boxes and ropes etc. added to the confusion, and Mrs Gray found some fossil shells belonging to the Lewis Abbott collection, which were duly returned[66].

Mrs Gray's peremptory concern over prompt payment as she fulfilled each of the conditions laid down was warranted; the precision of the operation was only evident at the Edinburgh end[67]. Each payment had to be sought after promised fulfillment was overdue, allegedly this was largely due to administrative oversight or intentional delay. However, Smith–Woodward kept his own promise and managed to ensure that full payment was made within his specified two years[68]. Finally, Mrs Gray wrote to him (24 March 1922) acknowledging the receipt of the final payment and thanking him for 'all the consideration' during the purchase of her collection. She had achieved her object and was able to say: 'It is a matter of complete satisfaction to me to know that the result of over sixty year's work is in safe keeping.'

With the money that she received Mrs Gray set up a fund for her unmarried daughters, two of whom were simply referred to as fundholders on their later death certificates. At the time the first payment was due to her from the BMNH, she had written to Smith-Woodward (27 May 1920) asking that the money should be made payable to both her and her daughters jointly, since they had always been her co-workers and collectors. Unfortunately, this could not be effected as authority for the payment had only been sought in her name.

(ii) Subsequent Collections

In January 1937, Alice Gray wrote to Dr Lang offering the BMNH all the fossil material that the family had collected at Girvan since their earlier collection was purchased in 1920. Although several specialists[69] had since examined particular groups, most of the 16,000 specimens came into her 'un-examined' category. W. N. Edwards, in the absence of the Keeper, hurriedly accepted what he described as their 'extremely generous offer'. Lang, on his return, immediately repeated the Museum's appreciation of their gift. In response to the request of Mrs Gray's daughters, that the additional material should be added to the main Gray Collection and held under the same conditions, he explained that: 'Mrs Gray's collection was purchased ... in normal circumstances, that is unconditionally, as indeed all specimens ... have officially to be.' Lang described the procedures adopted by his Department for dealing with such material, at length. He endeavoured to assure them that the practice of using distinctive printed labels to identify the specimens, ensured that the source identity was maintained even when particular groups were dispersed to the relevant sections. Commenting on Mrs Gray's original request that her material should be retained as a single unit, Lang explained that this was not possible for the methods adopted by the museum to assist research and organise its collections, meant that the various parts had to be distributed amongst different areas of the main Collection. However, Lang again re-assured Alice Gray that there was never any problem in recognising material from a particular collection. He undertook to pay the carriage and offered assistance with its packing.

Subsequent correspondence over the succeeding months dealt with matters of packing and transport, and it was arranged to despatch it locality by locality. However, after

dealing with the first consignment, Alice asked Lang for assistance since the time and energy involved in packing the entire collection 'is more than we can undertake'. He promptly sent two members of the Department to assist in its preparation and movement down the flights of stairs at 59, George Street[70]. By the beginning of May, all the later Gray material had reached the BMNH and Alice Gray asked that it should be incorporated into her mother's collection: 'as our mother took part in the work for three years ... and we wonder, if this and our mother's collection should be regarded as a whole?' The designation of 'Mrs Robert Gray Collection, 1937' adopted to record this donation delighted the family and satisfied the needs of curation.

The Sedgwick Museum, Cambridge also received various smaller donations from the Gray Collection, as a result of Reed's publication of the descriptions of particular groups[71]. Further donations were made later by Alice Gray *c.* 1937–38 as Reed produced other papers based on subsequent material (see Alice Gray's correspondence: Reed, 13 January 1938 Mss list) and this donation has been recorded in the literature as 'Coll'n. the Misses Gray' (see letter 14 February 1938)[72].

After the death of Alice Gray in Febuary 1942, Edith her surviving sister, wrote to both Dr Lang and W. N. Edwards (4 August 1942) informing them of a further quantity of material 'the results of their collection from time to time' that needed to be added to the Gray Collection. Its despatch to London had to be left until the termination of the Second World War when transport was more readily available. Unfortunately, Edith Gray also died during this period and it was only through the astuteness of her solicitors that the last phase of the Gray Collection was obtained by the BMNH[73]. When the premises at George Street had to be vacated quickly, the BMNH sought the assistance of the Geological Survey staff in Edinburgh to pack and arrange the storage of this material. Although this was achieved by April 1945, the matter was only finally resolved at the end of June owing to a disagreement with the Survey by W. N. Edwards over the wording of the bill, which mentioned the assistance and services of a firm of carriers and cabinet-makers, to carry out the transfer.

7. THE GIRVAN FAUNA

(i) The Ordovician Age in relation to the Girvan fauna

The majority of the specimens in the Gray Collection are from a thick sequence of Ordovician rocks occurring in the Girvan area, which are part of a chain of Palaeozoic inliers stretching along the Midland Valley from Edinburgh to the coast. The basic stratigraphical succession of the Girvan 'shelly faunas' was worked out with precise geological mapping and palaeontological observation by Charles Lapworth (1882). He used graptolites as biostratigraphic indicators, a method he had introduced when dealing with the 'Moffat Series' (1878) for correlating the two sequences and recognised that an immense thickness of rocks was present at Girvan, in contrast to that in the Southern Uplands. Although his succession has been refined, it had never been seriously questioned (Clarkson, *1985*: 4), but an alternative explanation for the structure present in the latter area has now been established. Harper (1982*b*, 1984) has provided a revised interpretation of the stratigraphy of the Upper Ordovician Girvan sequence and shown that it is of late Caradoc (Onnian) to late Ashgillian (Hirnantian) in age.

The Ordovician Period is remarkable in earth history for a number of important reasons (Jaanusson, 1984). Its most distinctive feature was the extent of the epicontinental seas which covered a greater area of the globe than in any other geological period, with the land areas mainly represented by small archipelagos rather than continents.

Consequently, the supply of terrigenous material was very low and this favoured the wide deposition of carbonate sediments suitable for marine organisms.

The period is also marked by considerable changes in both flora and fauna, particularly in the composition of its marine faunas. One reason for this is that a number of major invertebrate groups appear, become common, or more diverse for the first time. Among the most important benthic groups are the stromatoporoids, corals, cystids, crinoids and echinoids, although the bivalves and caphalopods also show significant changes—and of even more significance, the planktic graptolites. Jaanusson emphasized that important effects were produced amongst the skeleton-bearing associations and assemblages resulting in the establishment of the characteristic Palaeozoic biotic organisation of the epifauna. However, he also pointed out that the full explanation for many relationships has not been established, owing to the difficulty of distinquishing between ecological and geographical factors. The Ordovician is also characterised by extreme biogeographical differentiation in its marine faunas, which occurs to a greater degree in the benthic elements. The classification and correlation of Ordovician deposits is further complicated, since the benthic and planktic faunas are often not contemporaneous, features which have led Jaanusson to conclude that it is, perhaps, the most confused of all periods.

Fortey (1984) by examining global Ordovician transgressions and regressions has provided explanations for several of these aspects. Using a series of biogeographical models to demonstrate the occurrence of trilobite and graptolite biofacies he showed that the faunal changes that had occurred were as much the result of 'environmental shift as of evolutionary novelty'. He also indicated that 'ancestral faunas' had often been overlooked owing to the scarcity of the preservation of the relevant facies, but that these were available in the correct situations. Brenchley (1984) has outlined the possible causes of the significant Late Ordovician extinctions in many invertebrate families, genera and species. He pointed out that the earliest phase affected the deep-shelf Trilobite—Cystoid—Gastropod faunas that had already been displaced over the shelf edge by the initial phase of falling sea-level. Many groups show a sharp decrease in numbers and the gradual depletion of species richness in Trilobites, Brachiopods and Gastropods towards the Ordovician—Silurian boundary had been demonstrated by Williams & Wright (1981). Such changes were attributed to a drastic decrease in habitable area as a result of successive changes in sea level, which resulted from the growth and decay of the Gondwana ice cap. Associated changes in salinity and ocean temperature may have also caused extinction in planktic faunas.

The historic Gray Collection, with its relatively well-localised Ordovician material has considerable significance in resolving some of these questions of spatial distribution. Although several Ordovician specialists have collected better and more reliably-zoned specimens (see Harper, 1984: 12) the taxonomic importance of Mrs Gray specimens is fundamental to their identifying such material. In addition, several of her sites are no longer available, having been worked out, or even lost. Jaanusson concluded (p. 3) that a solid taxonomic framework is a necessary foundation before stratigraphical, ecological, or palaeogeographical conclusions can be made.

Ingham (1978) and others[74] have described the general palaeogeographical setting as that of a proximal fore-arc basin occurring on the northwestern margin of the Palaeozoic Iapetus ocean. But Curry *et al* (1984) have emphasized (quoting Dewey, 1982):

> plate tectonism operates on such a vast scale that it becomes extremely difficult to deal meaningfully with relatively minute field phenomena

The Girvan succession has been interpreted as recording the development of two fan-delta systems (Ince, 1984) with the Stinchar Limestone being a shallow marine fan-delta abandonment facies. On the basis of such research, Clarkson (1985) summarised the

current picture of the Girvan Ordovician as an area of subsidence, in which the sedimentation was controlled by a series of moving large strike faults. Several giant alluvial submarine fans contributed sediment from the North and this spilled over the edges of the fault-bounded shelves. As this model was based on palaeontological research and biostratigraphy, it demonstrates the effective contribution that these disciplines can still make to good geology.

(ii) The Silurian Rocks of the Girvan Area

By L. R. M. Cocks

(a) Summary of Silurian Stratigraphy

Silurian rocks occur in two main areas north and south of the Girvan valley, which is occupied by Upper Palaeozoic rocks. These formations are nearly 3000m thick and were chiefly deposited in a turbidite environment. The initial indifferent work of the early nineteenth-century geologists, including Murchison (1851), and Lapworth's classic work (1882) was superceded by a revision carried out by the Geological Survey (Peach & Horne, 1899). This largely confirmed Lapworth's results and was reliable for the next seventy years. However, at the end of that period it became clear from studies of Silurian rocks in the Welsh Borderland and elsewhere, that the succession in the Girvan region needed to be revised and that many of the stratigraphical formations devised by Lapworth needed adjustment to modern standards. Thus the area was re-mapped, and further fossils collected by Cocks and Toghill (1973), who devised a new stratigraphy, made fresh correlations from their results, but endeavoured to conserve much of Lapworth's terminology.

Cocks & Toghill found that the Silurian rocks were confined to the Llandovery, apart from the very highest beds in the Knockgardner area which are of basal Wenlock age. They established three separate stratigraphical successions (*ibid*, t.-figs. 8 & 9):

1. the Coastal region;
2. the Main Outcrop (which runs from Saugh Hill to Straiton); and
3. the Craig Head Inlier.

1. On the coast, south-west of Girvan there are two areas: The Haven (Shalloch Forge) and Woodland Point. At these, the Craigskelly Conglomerate unconformably overlies the Ordovician Shalloch Formation of Middle Ashgill age, and that conglomerate is succeeded by the Woodland Formation, which in turn is overlain by the coarse turbidites of the Scart Grits. The Woodland Formation yields abundant late Rhuddanian brachiopods, including *Stricklandia lens lens*, which are overlain by graptolites of the *cyphus* Zone.

2. In the Main Outcrop all the beds are steeply inclined and often inverted, while they underlie the older Ordovician rocks to the South. There is also a strong unconformity, but with no conglomerate and only rare shells in the beds overlying it. The lowest Silurian beds are the dark mudstones of the Tralorg Formation, which also yield *cyphus* Zone graptolites. These are followed by the turbiditic Saugh Hill Grits and then the Pencleuch Shale yielding *convolutus* Zone graptolites of Aeronian age. These are overlain by another unconformity, followed by the transgressive beds of the Lower Camregan Grits that contain a shelly-fauna, which includes the stratigraphically important rhynchonellide *Eocoelia curtisi* in abundance; and then the deeper water, but still shell-bearing mudstones of the Wood Burn Formation. A series of shales and turbidites, named in succession as: Maxwellston Mudstones, Upper Camregan Grits, Penkill Formation, Protovirgularia Grits, Lauchlan Formation, Drumyork Formation, and Blair Shale. Successively, each of these yield graptolites that represent the complete Telychian

sequence of *turriculatus*, *crispus*, *griestoniensis* and *crenulata* Zones, but with no shelly faunas. After this there is a regressive sequence commencing with the conformable beds of the Knockgardner Formation that yield basal Wenlock shelly faunas. The overlying Straiton Grits carry a few ostracods and bivalves interbedded with 'Old Red Sandstone' facies of presumably Wenlock age, representing the marine regression seen in other inliers in the Midland Valley of Scotland. These Grits occur immediately below the substantial unconformity overlain by the true Old Red Sandstone of Middle Devonian age.

3. The Craighead Inlier is an assymmetrical anticline with a core of Ordovician rocks and is completely surrounded by Old Red Sandstone and Carboniferous formations. Lapworth (*ibid*) formulated the successsion of this inlier; Lamont (1935) augmented and divided some of these terms; while Freshney (1959) replaced the latter's names for the divided Mulloch Hill Sandstone and indicated that the inlier extended further to the northeast. In ascending order, the basal Silurian unit—The Lady Burn Conglomerate—rests on different Ordovician formations at different localities and only one of these junctions is well exposed (C. & T., 1973: 213) with an unconformity being postulated for the other. This massive conglomerate contains sandy lenses that can be fossiliferous with a low diversity *Cryptothyrella* community (of Rhuddanian age) and sediments that indicate deposition in shallow water. The successive Mulloch Hill Formation is the most fossiliferous unit of the inlier and consists of green 'Rough Neuk' and buff 'Craigens' sandstones, which are interbedded with each other. The faunas represent shallow water to mid-shelf communities. However, near the top a quite different and richer fauna, identified as a *Clorinda* community, suggests deposition at greater depths and is a prelude to those occurring above. The succeeding laminated light and dark units of the Glenwells Shale contain a graptolite fauna indicating the upper *cyphus* Zone. This is overlain by the easily mappable, unfossiliferous, coarse and poorly sorted Glenwells Conglomerate. The Newlands Formation, with its diverse fossil assemblages of *Stricklandia* and *Clorinda* communities, comprises the only shelly Middle Llandovery in the whole of Scotland and was possibly deposited upon the deeper part of the shelf. The soft thinly bedded shales of the Glenshalloch Shale have yielded well preserved graptolite faunas at some localities of *gregarius* Zone age with two different Subzones. The Upper Saugh Hill Grits comprise massive greyish-green turbidites, mostly coarse-grained and unfossiliferous. The limited exposure of the overlying Peneleuch Shale has yielded a graptolite fauna typical of the upper *convolutus* Zone, but which may be close to the faunal boundary. Similarly, exposure of the Lower Camregan Grits is poor, but elements from both *Eocoelia* and *Pentamerus* communities have been obtained from different localities.

(b) The value of the Gray Collection

The Girvan fossils were known long before the Gray family came to prominence, but by the time that Lapworth wrote his paper, their collection numbered '*between 20,000 and 30,000 specimens*' (Lapworth, 1882: 551) and has formed the basis for many palaeontological papers both beforehand and afterwards. However, the main disadvantage to subsequent users is that the Gray collection is very biased towards the shelly fossils; there are very few graptolites despite Lapworth's utilisation of such fossils and that 14 of the 23 Silurian formations commonly have graptolites. This is also in contrast to the greater thickness of graptolite-bearing rocks occurring in the sequences of the Girvan area, which amount to more than ten times the thickness of the shell-bearing formations. It would appear that the Gray family were more interested in fossils that they could easily recognise and preferred to work at a relatively small number of localities where they could be sure to obtain them. This is borne out by the collections in the BMNH, for there

are 23 closely-packed drawers of brachiopods collected from the Llandovery locality of Woodland Point, but other equally rich localities are either entirely absent in the Gray Collection, or merely represented by a handful of specimens. Nevertheless, the assiduity of the Gray family meant that nineteenth-century palaeontologists had a valuable pool of first-rate specimens available for their research. In turn these monographs were extremely influential in making 'Girvan' an international byword as a source of Lower Palaeozoic invertebrate fossils.

(iii) Interpretation of the Girvan Fauna

In a presidential address, Robert Etheridge (1881) when emphasizing the importance of fossils in interpreting the Palaeozoic rocks of Scotland, mentioned (p. 6) that the first record of material from the Girvan strata was a short list provided by Professor Nicol (1844)[75]. Apparently, Sedgwick had only briefly visited the district during his tour of 1841 and was not able to collect any material until a later visit in 1848[76]. M'Coy described this in a series of papers (1851–52), that must be regarded as containing the first descriptions of Girvan fossils[77]. These, together with others were subsequently included in their joint publication on *British Palaeozoic Fossils* (1851–1855)[78]; Etheridge estimated that thirty-four species were from the Girvan area. J. W. Salter[79], was another responsible for the early description of Girvan fossils, his first contribution being appended as a list to Murchison's memoir on the Silurian of southern Scotland (1855)[80]. These fossils had been obtained by Murchison in 1850 with the assistance of Alexander MacCallum, a local weaver, who is said to have been the first person to collect fossils from the area (*ibid* p. 9) and to have acted as a guide for all visiting geologists. Salter described thirty-seven species some of which provided the first indication of the link between the Girvan and North American faunas. More recent descriptive work has led to the correlation of the dominant phylla in these Scottish faunas with those found in North America. In particular, it has shown that the brachiopods had 'little in common with Caradoc faunas found elsewhere in Britain and Europe' but that their Girvan sequence is recognisable in the Mohawk stages of the southern Appalachians (Williams, 1962: 62).

Harper (1979) has established the faunal associations that occur throughout the Girvan sequence and shown that brachiopods are frequently numerically dominant in many of these. Trilobites occasionally dominate several of the associations found in the Upper Whitehouse Group e.g. the 'Foliomena fauna' (*ibid.*: 440) and graptolites provide adequate stratigraphical correlation. The later Drummock Group has a great many distinctive faunal associations and in its upper part contains the very diverse and abundant faunas of the Lady Burn Starfish Beds (Lamont, *1935*; also provided lists of the fauna).

The majority of the earlier faunal studies were based upon the large collections accumulated by Mrs Gray and the Misses Gray; John Smith of Dalry; and James Begg of Glasgow. As these descriptions were produced by palaeontologists, who were strictly museum specialists and who neither had the opportunity, or often the inclination to conduct fieldwork[81], their results inevitably contained errors arising from confusion over fossil relationships and occurrences. F. R. C. Reed, in particular, treated material from a number of localities together and created a false homogeneity within his faunas and taxa (see Harper, 1984: 22, for example of *L. mediostriata*). It is only with modern collecting techniques ensuring precise stratigraphical provenance and descriptions based on the numerical analysis of the fossils in certain groups (brachiopods, trilobites, cystoids and graptolites) that their mistakes have been rectified. A cursory examination of the range of the fauna's descriptive literature suggests that it was produced in three periods. An 'exploratory phase' arising from the work of Murchison, Sedgwick and others; then a

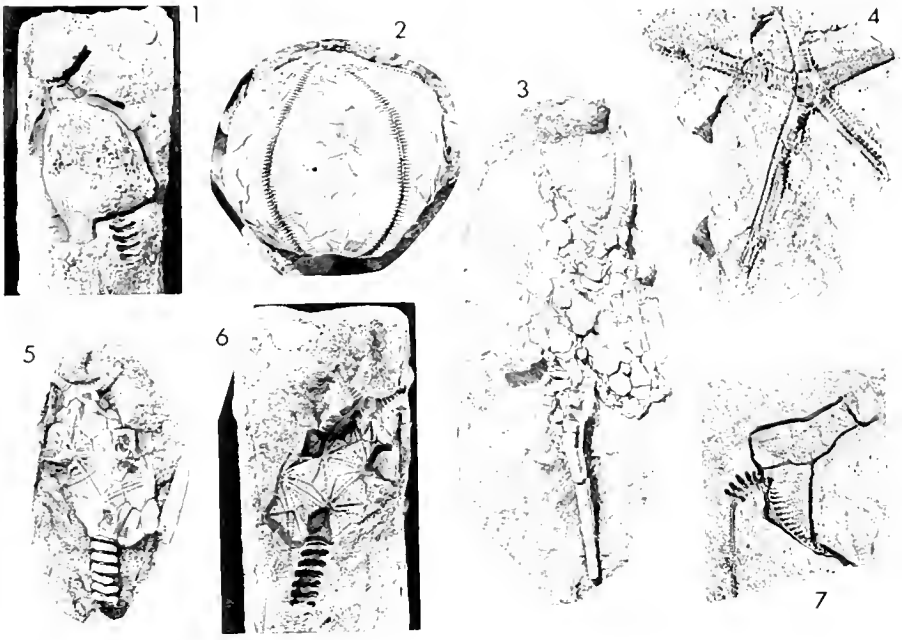
more sustained 'accumulative' phase (*c.* 1870–1924) prompted by Mrs Gray's collecting activities and her concern for the description of the material by experts to reveal the number of 'new species' present, which then extended into a second stage (*c.* 1930–46) partly as the result of the continued activity of the Misses Gray, but also from the interest of other keen collectors such as Begg and Lamont; and finally the present one (1956–84) that might be termed the 'authoritative, or interpretative' phase arising from the active interest of a wide range of palaeontological and stratigraphical specialists investigating all aspects of Ordovician invertebrate faunas [Harper, 1982*b*: 253–4, has summarised all work on the Girvan fauna][82].

Understandably the numerically abundant brachiopods have been dealt with most completely and provided much of our knowledge of these faunas. Ordovician brachiopod workers have made considerable progress in revising the systematics of earlier workers (Cocks, 1978); in addition, others have also interpreted the ecological associations and environments in which the Girvan species lived (Harper, 1979, 1984); and their stratigraphy (Cocks & Toghill, 1973). Williams (1962) used brachiopods as a further stratigraphic key to unravel the structure of the area, since many of the species are identical to those occurring in the undeformed platform carbonates of eastern North America, where the succession is well-defined. Harper (1979, 1984) has also worked on the formations of the Ardmillan succession, which form the sequence from which most of Mrs Gray's fossils were collected and has shown that very few of the fossils occur in indigenous situations. The changing composition and structure of these brachiopod associations reflected an essentially unstable environment. He suggested (1979: 443) that the predominantly common association of small dalmanellids and plectambonitaceans occurred on an unstable offshore continental slope and as a possible site, Harper envisaged a constantly changing submarine fan in relatively deep water. The damaged condition of the majority of these brachiopods, which include individuals from both presumed shelf and slope communities, indicated they had undergone transport from their original site and the lack of juvenile forms tended to confirm this view.

Initially, the trilobites were dealt with by Nicholson & Etheridge in their general description of the Girvan fauna. Reed (1903–35) subsequently revised and described them more completely and apart from Howell's full treatment of all the Silurian species (1982), the current approach has been for specialists to deal with particular families (Whittington, 1950; Lane, 1971; Owens, 1973) after supplementing original material by making personal collections. However, various authors (Tripp; Ingham; Hughes *et al*) have examined other aspects of the Girvan trilobites.

In comparison with the other groups, the relatively rich British Ordovician fauna of primitive echinoderms has been considered to be poorly known. One reason for this is the rapid disarticulation of such animals after death (Donovan, 1986: 1) and Smith and Paul (1982: 604) have indicated the relevant rate of this disassociation in the enigmatic cyclocystoids. Without being suddenly overwhelmed and pinioned by debris, or sediment, the weak compound skeletal elements of echinodermata would soon begin to separate as their skeleton disintegrates very rapidly after death. Goldring & Stephenson (1972) in their discussion of the preservation of ophiuroids and echinoderms indicated that the only chance for their fossilisation was instantaneous burial by slumped sediment[83]. Their conclusion that the Girvan Starfish Bed fossils had resulted from such rapid entombment in a turbulent, shallow water environment was modified by Harper (1982*a*: 30) to burial during sudden downslope movement of both sediment and fauna.

In part, the apparent abundance of primitive echinoderms can be explained by the explosive radiation of echinoderm classes that occurred during the Lower Palaeozoic. Paul (1973: 1; 1984) in his monograph of the British Ordovician Cystoids stated that it was one of the richest cystoid faunas in the world, . . . and was the result of migration from three separate faunal provinces into the area. He listed eleven taxa from Girvan



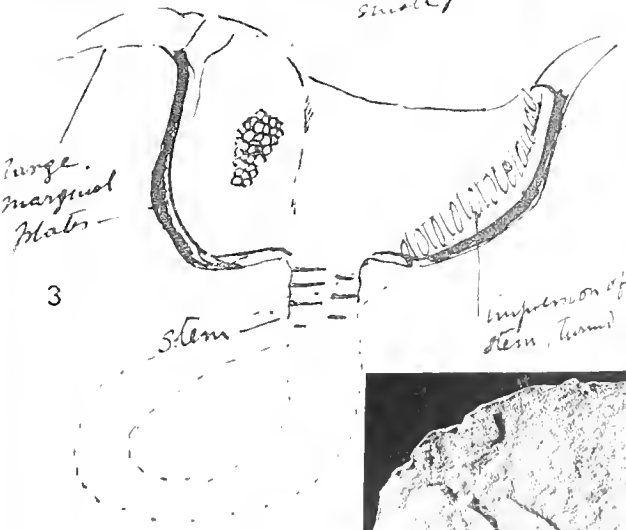
Echinodermata found in the Starfish Bed, Lady Burn.
1, 5 & 6 *Pleurocystis quadrata* Bather
1 & 6: Part & counterpart of original specimen E 23298b × 1;
5: Latex pull from specimen × 1; Mrs. R. Gray Coll'n., 1920.
2. *Aulechinus grayae* MacBridge & Spencer. E 405522a × 1; Coll'd. Alice Gray, 1934.
3. *Dendrocystis scoticus* (Bather). A latex pull from E 23700 × 1; Pres'd. Misses Gray, 1937.
4. *Cnemidactis girvanensis* (Schuchert). E 53835 × 1; Purch'd. from Mrs R. Gray, 1920.
7. *Cothurnocystis elizae* Bather. E 23702b × 1 approx.

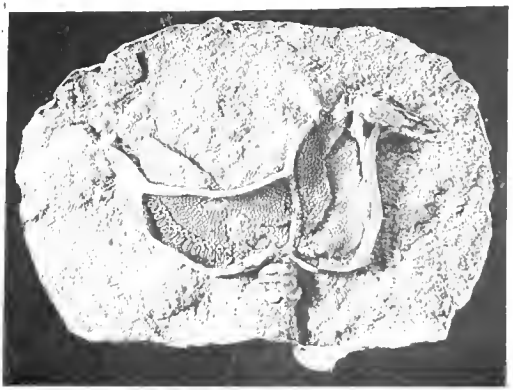
localities (p. 76) and suggested (p. 121) that ideal conditions for pleurocystids apparently prevailed during Starfish Bed times, since three species are recognised; and their preservation indicated that they were buried alive by a sudden influx of sediment.

Despite Bather's predominant interest in the Crinoidea, he made very little contribution to knowledge of the Girvan crinoids. Prior to Ramsbottom's monograph (1961), only one of the five described Ordovician crinoids had been recorded from Girvan[84]; he increased the number of known species to twenty-three, with twelve of these being found at Girvan[85]. Ramsbottom questioned the occurrence and identity of the material previously described by Nicholson and Etheridge (1880) and Bather (1896); and in

Cothurnocystis elizae Bather.
1. Original specimen BMNH E 23702b × 2 approx., presented by 'The Misses Gray' in June 1937.
2. A latex impression taken from the original × 1.
3. Another Gray specimen depicted in a rough sketch showing Bather's interpretation (letter 16 January 1899):
The specimen . . . though so imperfect as to be scarcely recognisable . . . is, I think, different from any previously described. But is hardly good enough to give a name. . . . We have no British specimens . . . in this Museum!
4. Latex pull from E 23172 × 1, showing the fine detail that is preserved in some specimens.

small plates of anal side





recognising (p. 111) that the latter had misinterpreted crinoid features incorrectly as a result of the imperfect techniques available to him for dealing with difficult material, may have given a reason for Bather's limited results. Later, Strimple (1972) and Donovan (1983) made further nomenclatorial revisions and increased the number of crinoid species (Brower, 1974; Donovan, *In Press*) to thirty. Paul (1965) had earlier described the only record of the class Paracrinoidea from Britain. Spencer's work on the Palaeozoic starfishes is discussed elsewhere (p. 188).

The most significant element in the Girvan echinoderm fauna must be the specimens of 'carpoids' that Jefferies (1968, 1986) has now convincingly interpreted as calcichordates[86]. These strange fossils, traditionally regarded as primitive echinoderms, were in fact chordates, an idea that had first been postulated by Gislen in 1930. They have many chordate, and sometimes vertebrate, characteristics, but they also possess certain echinoderm-like features. The detailed analyses of these fossils by Jefferies *et al* are based upon functional explanations for virtually all their anatomical features, particularly their internal anatomy, and establish that they were ancestral to all modern chordates including the vertebrates. Alternative theories on these 'carpoid' groups (the solutes, mitrates, cornutes) recognising them as echinoderms, founder on several aspects of functional interpretation and always lack vital structures. The two cornutes *Cothurnocystis elizae* and *Scotiaecystis curvata*, both described by Bather from the Gray collection, had an important role in the investigation, which led to the new theory and has solved one of the problems of classical zoology. In his original paper, in fact, Bather too, considered that *Cothurnocystis* might be a chordate, but rejected the idea (1913: 417).

Bather's paper has been recognised as an enormous advance in the knowledge of these bizarre-looking fossils. Both he and the Gray family independently referred to *Cothurnocystis elizae* as 'the boot' (see letters 7 & 8 November 1911). The following year, in recognition of her contribution, Bather named the species after Mrs Gray and decided to use the form *elizae* because it made a 'pleasant sounding combination'[87]. Jefferies (1986), in his detailed and readable explanation, described this species as 'one of the strangest-looking animals that ever existed' and acknowledged its companion cornute to be a more specialized form (p. 207). We wonder just how Elizabeth Gray would regard the first comment and the fact that Bather named such a creature after her! Perhaps, the final sentence in that book would have convinced her that the effort was worthwhile, for together with his predecessors, Jefferies acknowledges that 'the nub of the whole matter is the extraordinary group of fossils called calcichordates'. Although the two Girvan species do not occupy vital positions in the cladogram of the Dexiothetica, the investigation of their features had a major part in the development of this research and led to the development of new investigative techniques. That alone, we feel would have pleased her, but the realisation that her beloved 'cystid' material[88] provided two British scientists with a significant part of their life's work [she was somewhat patriotic!] and had a substantial part in the development of a new theory, would we suspect, in Mrs Gray's view, have been a reward equivalent to her recognition by the Geological Society in 1903.

It would appear that apart from the less numerically abundant elements of the faunas e.g. sponges, conularids (see Slater, 1907), hyolithids etc. only the various classes of mollusca have received less attention than they deserve, with the bivalves faring worst of all; although treatment of the newly recognised classes of the monoplacophorans and rostroconchs is equally poor[89]. In many respects, aside from problems of preservation (which can be overcome), this is due to the practice within molluscan taxonomy of describing material on a zoological rather than a faunal, or stratigraphic approach[90].

The 'strange-stalked forms' that initially were referred to as Cirripedia attracted the interest of Woodward (1880); Bather (see letters & 1926: vi); Reed (1901); and ultimately after the Gray Coll'n. had been acquired by the BMNH, Withers (1922), who

recognised their distinctive characters and established the Group Machaeridia (1926) to accommodate them.

(iv) The Starfish Bed, Lady Burn

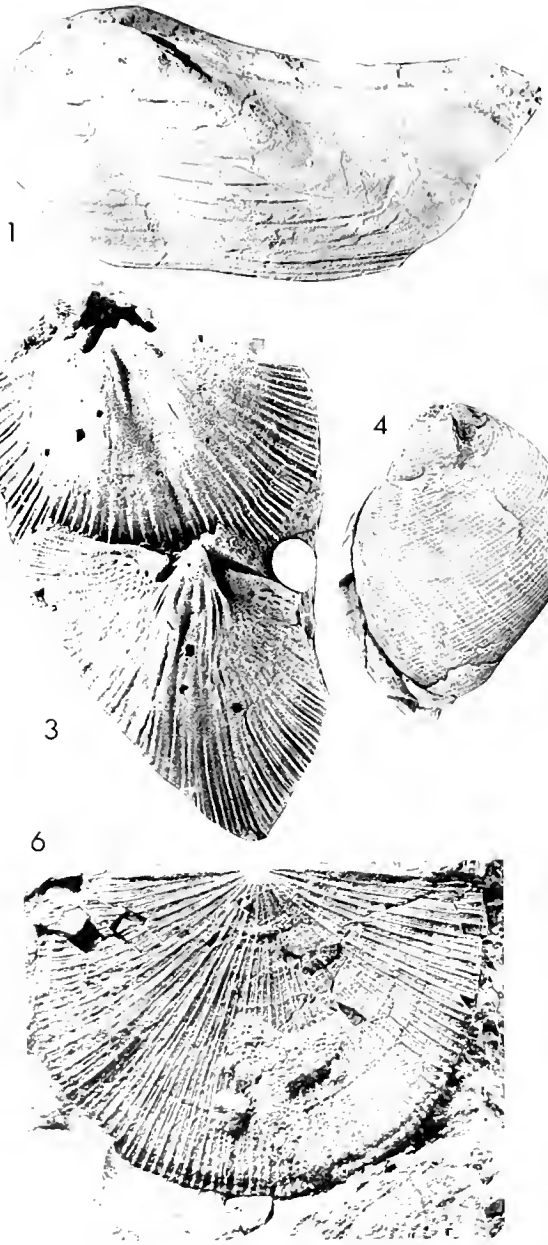
In a postscript of a letter to Professor Lapworth, Mrs Gray mentioned her 'discovery' of the now famous Starfish Bed at Lady Burn (20 November 1898). A subsequent and much later note by Alice Gray[91] indicates the importance that the family attached to this discovery, for the Grays were under the impression that their site was not the Starfish band, West of Quarrel Hill described by Lapworth (1882: 619, fig. 21). This was thought to have been in an old quarry, for which the family had searched in vain. However, although Lapworth referred to a fossiliferous sandstone being found in an old quarry, there is no precise evidence that he encountered these rocks *in situ* (see Harper, 1982*a*: 30), but merely correlated that bed with the similar sandstone occurring beneath the waterfall at the head of the Lady Burn. In fact, in his letter to Mrs Gray, Lapworth confirmed that his best specimens had been obtained from walls in the neighbourhood of Quarrel Hill. In the Gray's opinion, Lapworth never saw their 'new' Starfish Bed. However, we consider that this is a slight misapprehension and agree with Harper (*ibid*) that the Gray's re-discovered the Starfish Bed and were probably the first to collect such material *in situ*. The general photograph of Mrs Gray at the Starfish Bed locality [Fig. 2, p. 176] shows a considerable exposure of rock, with the Starfish Bed near the piece of newspaper at the top. The Starfish Bed is the hardest rock available for repairing a drystone dyke and it is very likely that it would have been quarried here.

Lapworth's short faunal list is in accordance with the belief that only one Starfish Bed locality is involved. However, Harper endeavoured to establish the occurrence of the Bed at its type locality over several years and in 1978 successfully located three fossiliferous sandstone beds, which in part substantiated Begg's documentation (1946) of several fossiliferous units at this classic site. Harper concluded (1982*a*: 31) that the lowest bed corresponded with the original Starfish Bed as its lithology and fauna was virtually identical with material in museum collections. The excellence of preservation at all three levels was unusual with most of the fossils being complete and breakage, or wear almost negligible. He concluded that each bed had been deposited in slightly different conditions on the indications of their faunal composition and agreed in part with the opinions of Goldring and Stephenson (1972) but felt that there was no strong evidence to deny that rapid entombment of the fossils followed sudden downslope movement.

Examination of current faunal lists reveals that a wealth of new invertebrate forms have been described from this Bed since Mrs Gray provided Nicholson & Etheridge with two new Star-fish (1879: 318)[92]. Collecting proceeded rapidly and her correspondence with Bather and other palaeontologists continued in earnest to ensure that the exceptionally large collections resulting from the relentless activity of the Gray family at this locality were dealt with. [Gregory originally undertook to deal with the interesting starfish and Bather requested the crinoids]. She herself expressed amazement in a letter to Bather (12 March 1914): 'I seem to have sent [you] an astonishing number of specimens from the small Starfish bed.'

James Begg, a local property agent, magistrate and a renowned amateur fossil collector, has related how the Grays regularly covered up the exposure of the Starfish bed with rubble before they left the site each day, in an effort to conceal the exposure from others. Begg obtained the assistance of a local poacher (and part-time miner) Tom Mactaggart, who lived close by at New Dailly, to enable him to discover the site of the bed and reach it at an un-worked level six feet deeper than the area cleared by the Gray family.

The Starfish Bed at Threave Glen (NS 250037), now included in the Upper Drummuck


1
2
3
4
5
6

Group is considered to be of Rawtheyan age (Williams *et al*, 1972). It has proved to be the most productive locality in the Girvan District and this importance has led to its registration as a site of Special Scientific Importance. Yet, information on the fauna is insufficient to permit a succinct appraisal; trilobites are particularly abundant and together with brachiopods numerically dominate the fauna, but bellerophontids may locally dominate the rich shelly fauna (Harper, *ibid*: 32). Regrettably, in common with much of the other molluscan material in the Gray Collection, these taxa need further systematic treatment.

8. CONCLUSIONS

The importance of the Girvan fossils for understanding Ordovician geology and the evolution of many invertebrate phyla, in addition to other palaeontological aspects, is widely accepted. Yet, the significance of the Girvan material would certainly not have been apparent at the time Mrs Gray began to collect. Why did she collect? It would be interesting, at the very least, to know the answer to that question. We suspect that she had several reasons and that these changed and developed over the years. Unfortunately, as no member of the Gray family kept a journal, and their surviving correspondence is essentially concerned with practical matters concerning the use of the collection, these cannot be verified. Occasional glimpses of Mrs Gray's attitude can be obtained from terse comments in her letters to Bather, or Davidson. While the much later accounts of the family's activities over the years, provided by Alice Gray, yield more tangible evidence.

In part, Mrs Gray's fossil collecting probably arose from her father's interest in local natural history; her own activities certainly increased after meeting Robert Gray another naturalist, but it is difficult to avoid the assumption that initially there would probably have been no real purpose to their collecting, other than providing themselves with a pleasant pastime. Many years later she acknowledged that such collecting had given her 'lifelong pleasure'.

The Gray family were fortunate, firstly, in that their collecting interest coincided with [and possibly stemmed from?] the establishment of the Natural History Society in Glasgow. Then, secondly, through the encouragement of its Secretary, Mr John Young and his contacts, their collection was utilised by Thomas Davidson. As a result, Mrs Gray was immediately provided with a particular objective and could contribute to the development of scientific knowledge. It would appear from the records that Davidson

Various Ordovician invertebrate fossils from localities near Girvan, Ayrshire in the Mrs Robert Gray Collection purchased in 1920.

1. Bivalve: *Cuneamya grandis* (Hind, 1910). L 49886, internal mould × 1 (the external impressions of both valves are also preserved); Upper Ordovician, Starfish Bed, Drummuck Group, Thraive Glen.
2. Gastropod: *'Loxonema' grayianum* (Longstaff). Holotype G 43539 × 2; Mulloch Hill.
3. Brachiopod: *Fardenia (Fardenia) columbana* (Reed). Lectotype B 72928, brachial valve, × 2 approx; Lwr. Llandovery, Mulloch Hill Quarry [= Rough Neuk].
4. Gastropod: *Cyclonema crebricostata*. G 47843 × 1; Upper Ordovician, Whitehouse Gp., Shalloch Mill.
5. A biserial Graptolite: *Orthograptus truncatus* var. *intermedius*. H 1915 × 2; Llandeilo, Lwr. Ordovician, Pinmore Cutting, S.E. of Girvan.
6. Brachiopod: *Fardenia (Saughtina) pertinax* (Reed). B 72948 × 1.5; Middle Llandovery, Woodland Point.

kept of his correspondence that he provided no particular direction to her collecting activities, but dealt with whatever was found. However, anything that was thought to be unusual or rare by either party, obviously led to particular use of Mrs Gray's 'good discriminating eye' on her next foray!

The unusual circumstances, which enabled Davidson to concentrate on his brachiopod research, possibly influenced Mrs Gray's understanding of the nature of such work. Subsequently, when allowing her material to be used by specialists such as Bather, or Lapworth, who had other tasks to perform, she frequently felt that they took an excessive amount of time to complete their research. Her view was also influenced by the fact that two other specialists, Mrs Longstaff and F. R. C. Reed, who also dealt with the Gray material, were able to determine the use of their own time and returned the fossils they examined quickly.

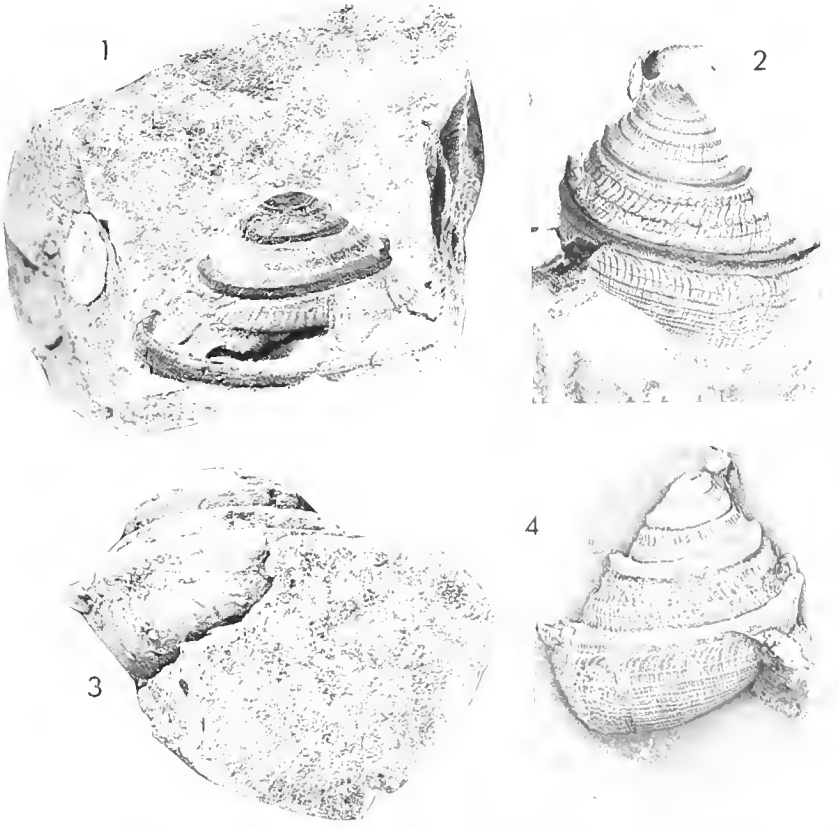
Through her contact with the needs of these workers, and her continuing field experience, Mrs Gray and the various members of her family were able to increase their knowledge of the various fossils they collected. Lapworth's field work resolving the Girvan succession undoubtedly provided her with useful experience and insight as to the significance of '**her fossils**' at an opportune moment. Subsequently, the long association with Bather's work on various fossil echinodermata provided the necessary continuation of purpose and contact, even though ultimately it may not have been particularly productive for either party with regard to their original objectives. However, this particular link provided the majority of the other specialists who worked upon Mrs Gray's material and probably led to the acquisition of her third and major collection by the British Museum (Natural History).

In our view, the reasons that Mrs Gray and eventually her daughters collected the Girvan fossils, developed over the years. As discussed above, Mrs Gray initially took an interest partly through a family background of local natural history and the fact that it gave her an interesting occupation. Indeed, there is no real indication as to the necessity of her becoming involved in the more practical duties of house-keeping, or whether she was able to avoid such tasks by her fossil collecting activities[93]. Once becoming involved in assisting specialists, an interest and awareness of the nature of fossil species led to objectives of extending faunal lists, discovering new species and[94] establishing occurrences. Her letters to Woodward (20 May 1914; 21 February 1920) emphasize the number of different species, new species, rare species, and larger, or finer specimens present in the Gray collection.

Eventually having acquired the necessary practical, technical, collecting and storing skills their material became extremely useful and unique. Ultimately, as Alice Gray recounted, the annual summer visits to relatives at Girvan were customarily spent collecting fossils — it had become a family tradition! There is even a suggestion that it had even become compulsive—almost an addiction—for immediately after each of the Gray collections had been disposed of another was begun.

Apart from her interest in fossils, we have little real knowledge of Mrs Gray's life. There is no information on the style in which the family lived; whether she had to carry out the normal tasks involved in bringing them up, or whether many of these duties were achieved by servants? The factual letters that survive provide no indication of other interests, or her opinions on events of the period. Although the difficulties the Gray family experienced during the Great War are briefly mentioned, these are relatively minor and there is no reference to the more significant events of those years and their consequences. The single surviving draft of a letter to another member of the Gray family in Australia[95] reveals that Elizabeth Gray was delighted to receive letters herself, but that: 'I always seem to find something to do—or take a rest!' and seldom wrote any herself. Even much of that letter is concerned with the Gray Collection and her obituary notice apparently confirms that all her leisure time, consistent with her limited domestic duties, was spent in dealing with her fossils.

At an early stage, Mrs Gray decided that she did not wish to acquire the necessary scientific knowledge to describe some of her own fossil material, but felt that her best role was to provide specimens for others[96]. However, her curiosity frequently compelled her to seek advice, or references to fossil organisms to improve her understanding[97] and on a few occasions to visit museums in order to examine comparative material[98]. At one time she even enquired as to the possibility of borrowing specimens from the Barrande collection herself. Several of her letters to Bather indicate that she had acquired considerable knowledge concerning the relationships of her material and could understand the problems they presented[99] and realised the significance of slight differences in ornament and size[100]. It would also appear that Mrs Gray had an awareness of brachiopod variability for many of the forms that she sent to Davidson have now been recognised as belonging to several different species and her original queries vindicated[101].



Part & counterpart examples of '*Lophospira*' *thraivensis* Longstaff from the Starfish Bed, Threave Glen, Girvan, Ayrshire, in the Gray Collection, 1920.
1. Block with External mould, G 25404 × 2.5;
3. its counterpart internal mould;
2. Another external mould, G 25407 × 2;
4. a latex pull taken from this mould showing shape and ornament of the shell, × 2.

In common with the layman, Mrs Gray had little real idea of the technical skills needed to deal with her material, or the time that such preparation required; or the difficulties involved in the illustration of such material. The inadequacy of the materials and equipment available at that period[102] were another factor—this is indicated by the subsequent re-interpretation of many Girvan taxa when techniques improved[103]. Although her letters indicate some awareness of these problems, the initial objective of having her material identified, ultimately became something of an obsession, and influenced her relationships with the users of the collection. In later life, Mrs Gray understandably became even more concerned to see the results of 'her lifetime's work' and was particularly exasperated that some of the earliest projects—those begun by Bather on the crinoids and starfish—were not completed. Her fixation leading to her comment (28 November 1912): 'surely you have no other material with a prior claim to mine', is excusable in view of her considerable anxiety expressed in a later letter (18 March 1913). According to Alice Gray (5 December 1937) the only letters of a forceful nature that Mrs Gray ever wrote, were those to Bather on this subject of 'her cystids and crinoids', and some others concerning the 'mis-use' of brachiopods from her collection by O. T. Jones without her sanction.

Although Mrs Gray undoubtedly obtained her main pleasure from the completion of work on material in her collection, she always professed to enjoy being of 'service to many geologists'. However her constant assertion as to ownership of the fossils, suggests that she did not fully ascribe to the view of other more philanthropic collectors, who recognised that their specimens really belonged to science. (see letters from W. R. Billings to Bather during the same period)[104]. Perhaps, it should also be asked whether it is right for one individual to occupy all the attentions of the few available specialist workers in a particular science at the same time? particularly as the object was as much for her own satisfaction as the benefit to science. Still in mitigation, it has to be acknowledged that Mrs Gray determinedly set out to ensure that the material should ultimately be available in the principal insitutions holding similar palaeontological collections.

Throughout her life, Mrs Gray appears to have had a close involvement with her fossils, they are always referred to as '*my*' specimens[105], several had pet names and she undoubtedly worried about them when they were away on loan and always insisted that everything should be returned to her. It would have been difficult for her to insist on the return of type and figured specimens to-day, for the ICZN Recommendation on type specimens is that they should be lodged in a recognised Research institution. The extent of her personal concern was demonstrated by an incident that occurred during the 1st World War, when:

> During a Zeppelin raid on Edinburgh . . . we spent most of the night in a bank on the opposite side of George St. — as being a much stronger building than the house we live in, which is one of the original houses and dates from 1790 — My mother put into a large handbag as many of her very best Cystids as it would hold and sat with it on her lap for 3 to 4 hours until the danger was past. She had some anxious moments during the War[106].

This trait became more accentuated as she grew older. It is possible that this possessiveness in the later years, may have reflected a realisation of the commercial value of her collection. Mrs Gray had certainly understood the significance of her collection when she first offered the trilobites to the BMNH in 1914 and the various users had always commented on the unique contribution it had made to their scientific work. Later, when the sale of the entire collection was negotiated in 1920, she was thinking in terms of obtaining a reasonable return for all her years of collecting the material. However, once the sum had been decided her attempt to have part paid to her daughters indicates that

she also had their welfare in mind. This is confirmed by the Fund that was set up after investing the money on their behalf.

Whatever her motives, and despite some understandable quirks, Mrs Elizabeth Gray's devotion to discovering the fossil faunas of the Lower Palaeozoic rocks of the Girvan District made a substantial contribution to British geology. Her determination to ensure that the material was adequately described by the most competent persons available was an even greater achievement. She completed the task she had undertaken by ensuring that the various collections she had accumulated were safely housed in the most reputable establishments in existence. Their value is exemplified by the comment of one of to-day's specialists: 'Anyone wanting to work on Ordovician faunas is compelled to use the Gray Collection!'

It is unlikely that Mrs Gray had set out to disprove the widely held belief of the early part of the nineteenth-century that '*Scotland was . . . poor in organic remains*'[107], but she certainly ensured that no one could ever assert so again! Her achievement is commemorated by the many Palaeozoic fossils that either bear her own surname, or that of one of the localities in the Girvan area, while Bather's use of *elizae* for the type species of the bizarre cornute *Cothurnocystis* makes a more personal tribute to her zeal[108].

9. ACKNOWLEDGEMENTS

Inevitably, in a collaborative study that has been pursued over several years, its authors will have incurred obligations to many individuals for help, advice and information. Our appreciation and gratitude is owed to many of our colleagues at the various institutions in which we have worked, or whose resources we have used. We trust that they will accept this general acknowledgement of their help for a complete list would only antagonise our editors.

Among those who services deserve special mention are:

at the Sedgwick Museum, Cambridge, Professor H. Whittington, David Price and the late A. G. 'Bertie' Brighton, who contributed details of material and the Cowper Reed reminiscences;

Isles Strachan, Department of Geology, Birmingham University, who kindly investigated the Lapworth papers and provided confirmation of material in the BMNH;

Ian Rolfe of the Royal Scottish Museum, Edinburgh for his encouragement and interest in the project over the years, and who, together with Bill Baird, provided information on Robert Gray and obtained illustrations of the George Street house; the use of this print with the permission of the Office of Ancient Monuments is also gratefully acknowledged;

Daniella Shippey, Edinburgh, who carried out various aspects of the genealogical research into the Gray and Anderson families on our behalf and has been awaiting this paper to satisfy the interest that aroused;

Dr J. A. Gibson (Scottish Natural History Library) for discussing the value of Robert Gray's contribution to Scottish ornithology; and finally,

Mr Ilgars Steins, ROM, Toronto for preparing the Girvan locality map.

The usual generous assistance provided by the staff of various units in the British Museum (Natural History) deserves more than customary recognition. We are particularly indebted to those in the Palaeontology Library, who allowed us access to the Gray family Archive held there; to friends in the Photographic Studio, who contended with assorted whims over possible illustrations, and produced admirable results from poor beginnings; while our fellow invertebrate palaeontologists, answered our Gray-related questions and assisted with their own literature resources and field knowledge. From these Dick Jefferies, is owed a greater debt, for he willingly commented on a later version of the manuscript and augmented our knowledge of the bizarre groups collected by Mrs Gray on which he is the acknowledged specialist; and equally the involvement of Sam Morris with the work of each of us requires similar recognition. Finally, we must express our thanks to Rex Banks, Editor of the Historical Series, who was prepared to accommodate the paper from the first and quietly ensured its realisation and to the Keeper of Palaeontology, Dr L. R. M. Cocks, without whose permission the project could not have even begun, for his contribution and approval.

10. FOOTNOTES

1. INTRODUCTION

1. Letter from Alice Gray to Dr Bather (14 July 1932) concerning a biography of her mother:

   > Mr Balsillie required an account of her life rather than an appreciation of her work. The family [therefore] were the most appropriate people to write such a notice.

2. **Wilfred Norman Edwards** (1890–1956). The first palaeobotanist to be appointed by BMNH (1913). His career was interrupted by both World Wars, but in the interval Edwards organised the extensive collection of fossil plant remains and gained an encyclopaedic knowledge of such forms and their literature.

   W. N. Edwards was appointed Deputy-Keeper in 1931 and had succeeded Dr W. D. Lang as Keeper in 1938—virtually the time his correspondence with Alice Gray began. His plans for the reconstruction of the Museum's exhibition galleries were thwarted by the 2nd World War and he was made responsible for the evacuation of all the collections. After 1945, he then had to arrange for their return and the repair of the damage suffered by the buildings.

   Other refs. see: *Jl. Soc. Biblphy. Nat. Hist.* **3**: 231–237; Stearn (1981: 241–2).

3. It is thought that financial reasons were partly the cause in the case of the first; and the Second World War prevented completion of the later attempt as Edwards was made responsible for the evacuation of the Museum's collections in 1941–42.

4. see W. N. Edwards / Alice Gray Correspondence:
   WNE letters dated—14/11/38; 31/5/40; 19/8/41; 7/9/41.
   AG letters—21/11/38; 21/5/40; 2/6/40; 15/6/41; 24/8/41.

2. BIOGRAPHY

5. See letter from Alice Gray 14 July 1932 for reference to Mr Balsillie. [MSS (*c.*1938) in Gray Correspondence, Palaeontology Library, BMNH].

6. *Pinnacopora andersoni*, Nicholson & Etheridge, 1880: 273, pl. 17, fig. 6, from Woodland Point named in 1880 'after the late Mr Thomas Anderson of Girvan, who was well known to Scotch geologists as having made extensive collections of the fossils of the Girvan area.'

7. **Robert Gray** (1826–1887). For biographical references see *DNB*, **23**: 19; *Proc. Roy. Soc. Edinburgh.*, **15**: 1–5; *Proc. nat. hist. Soc., Glasgow*, **2** (N.S.) 1888: xxii-xxiii.

8. Lectures to Ladies—Session 1869: Introductory Lectures to the classes of English Literature & Physical Geography given in the Corporation Rooms, Glasgow by John Nichol, BA and John Young, MD. James MacLehose, Glasgow, 1869.

9. 59, George Street. This property is situated in the centre of the city in a street that was once said 'to have no rival in the world' as its breadth (115 ft.), space and magnificent vista was considered to be 'unparalleled'. During the 18th, 19th and early 20th centuries it was considered to be a prime residential area and also contained the offices and principal premises of Scotland's insurance and banking businesses. (see James Grant, 1880–3: p. 139 in *Old and New Edinburgh: Its History, its People, and its places*. Cassell & Co. Ltd., Edinburgh, Vol. 2 384 pp.

   A letter of Alice Gray (10 October 1938) mentions that it was one of the original houses and probably dated from 1790. The first use of this as an address occurs on Mrs Gray's first letter to Bather dated 5 October 1892. The solicitors of Miss Edith M. H. Gray sold the house sometime during 1945; the Geol. Survey were able to gain access in March 1945 to pack the remaining fossil material. The house is now occupied by the Dunfermline Building Society (59a) and by T. & T. Clark, Publishers and the premises have obviously been considerably altered to permit present usage.

10. The 1891 census return records Mary and Alice as artists, Elizabeth as a daily governess, Edith as a teacher of music, and Robert as an electrical engineer's apprentice; there was also one resident general domestic servant, Edinburgh-born aged 22.

3. THE GRAY COLLECTION

11. Robert Gray (letter 17 September 1865). Baleletchie, 100 yds below Penwhapple bridge (Mrs Gray has been there daily for months); Craighead quarry long exhausted; Penkill the spot opened first by myself.

12. Davidson (12 September 1879) records a letter from Mrs Gray that offers a few brachiopods that she had collected from Doularg Barr, a locality that she had not previously examined.

13. Number of localities listed in Lapworth = 23; by Mrs Gray = 32; and by Nicholson & Etheridge = 40, but only 19 of these were included in the lists of the two others.

14. These are in the Map Room of the Palaeontology Library in a large folio labelled 'Maps of Girvan District Showing the Localities at which Mrs Robert Gray Collected Fossils'; Maps with annotations by Alice Gray, 1937.

    Include Ayrshire sheets of the 6" Ord. Survey, 1910 Edition: L SW; L NW; L NE; LV NE; LV SW & SE; LVI NW; LVI SW; LVI SE; LVI NE; LXII NW; LXVI NW.

15. Penkill. This is the locality that was alleged to have been 'Lapworth's mistake'. The locality map prepared by Alice Gray bears a note:

    > The rock showed on the E. bank of the Penkill Burn at this spot, where the burn is little larger than a field drain. For many years locality invisible because grass and soil have covered over the small fragment of rock that could once be seen

16. One of the earliest references to Mrs Gray's material in Davidson's Notebooks occurs under his entry for *Lingula ramsayi*: 'among a large number of examples collected by Mrs Gray'. Another is found under *Triplesia Grayi*: 'Mrs Gray considers this an uncommon species'.

17. Constant Prevost (1787–1856), the first Professor of Geology at the Sorbonne, 1831; his Lyellian approach to geology placed him in an unorthodox position within French geology; he was also among the first to stress the ecological significance of fossils.
    see *Dict. Sci. Biogr.* **11**: 1974: 133–4.

18. Leopold von Buch, German geologist (1774–1853), involved in all aspects of geology; he published the first geological map of Germany and was also responsible for distinguishing ammonites from nautiloids.
    see *Dict. Sci. Biogr.* **2**, 1970: 552–7.

19. —Yet, there is little evidence that such national fervour influenced Mrs Gray, although on one occasion (1 December 1910) she did comment to Dr Bather:

Pardon me for saying that I would prefer to see . . . your investigations on British specimens rather than on Foreign!

— but that was solely due to her self-interest in getting her own material dealt with.

20. There are twenty-eight notebooks containing records of Davidson's correspondence between 1 January 1847 and 19 May 1884 in the Archive & MSS collections of the Palaeontology Library, BMNH.
see List with dates in Appendix 1 p. 241. Dr C. H. Brunton and R. J. Cleevely intend to compile and publish an Index to these in the near future.

21. Alice Gray (31 March 1938) distinguished the contribution of the two Youngs:
Professor John Young (1835–1902). Geological Survey of Scotland 1861–66; Professor of Natural History at Glasgow University 1866–1902; Keeper of the Hunterian Museum. In 1864, when crossing Girvan Water, he broke his knee after slipping on a boulder and as a result remained slightly lame throughout his life.
Mr John Young (1823–1900). Assistant Keeper of Hunterian Museum 1859 to 1899. For biographical notices of both see p 210–12 & p 183–87 in MacNair & Mort (1908) *History of the Geological Society of Glasgow*.

22. For biographical references see: *Proc. Geol. Assoc., London*, **50** 1939: 235–286, bibliogr., portr, pls. 19 & 20; *Obit. Not. Proc. Roy. Soc., London.*, Ser. **B 92**, 1921: xxxi–xl and others given in Cleevely, 1983: 179.

23. Lapworth letters re Sale of Gray Collection: 12 April 1914; 10 June 1914.

24. Letters concerning missing graptolites: Mrs Gray: 9 February 1917; 20 September 1919. C. Lapworth: 20 November 1898; 29 November 1989; 12 February 1917; 24 September 1919; 5 November 1919. Prof. Boulton: 12 October 1921; 8 November 1921.

25. H. A. Nicholson & R. Etheridge (1878–1880). *A Monograph of the Silurian Fossils of the Girvan District in Ayrshire, with special reference to those contained in the 'Gray Collection'*. see Bibliography.

26. Benton (1979) listed all the species described in their monograph, but some of the species of *grayi* listed in the work had been named earlier by other workers in recognition of John Gray of Hagley Hall, nr. Stourbridge, who had made extensive collections from the Wenlock Limestone.

27. **Henry Woodward** (1832–1921). Keeper of Geology 1880–1901; his chief contribution was on Fossil Crustacea; for biographical refs. see Cleevely (1983: 316–17).

28. **T. Rupert Jones** (1819–1911). Palaeontologist who specialized in Entomostraca and Foraminifera; *Q. Jl. geol. Soc.*, Lond. **68**, 1912: lviii–lxi; list of other biographical refs. in Cleevely (1983: 166); a letter to Bather from W. R. Billings of Ottawa (26 June 1891) refers to that 'testy old Palaeontologist T. Rupert Jones!'.

29. See letters from Reed to FAB re study of trilobites in BMNH FR Cowper Reed Correspondence file: 21 August 1901; and Mrs Gray to FAB 11 April 1904.

30. See BMNH Correspondence Archive, F. R. C. Reed file: 35 letters from Reed between 17/12/1892 to 15/3/1920 & 17 letters from Bather in reply 22/7/1904 to 15/12/1925.

31. **John Walter Gregory** (27 January 1864–2 June 1932), FRS, FGS. An able and versatile geologist and palaeontologist, who joined the staff of the BMNH with Bather in 1887. Developed a keen interest in exploration following his immediate involvement in Museum expeditions (1887) and effectively became an explorer-geologist visiting most parts of the world. Resigned from BMNH when appointed to the Chair of Geology in Melbourne in 1901, but returned to UK in 1904 when given the same position at the new Glasgow University.
Obit. Not. Fell. Roy. Soc., **1**, 1932: 53–59.

32. In his review of Schuchert's revision of the Palaeozoic Stelleroidea, Bather (1915: 425) commented that 'this book is not what Prof. Schuchert intended when he began' and reflected

something of his own feelings with 'Congratulations . . . on having **at last** got this laborious and valuable piece of work *into the world*!'.

33. It may have been quite coincidental that Professor Schuchert mentioned the difficulties of identifying cystids when he wrote to Mrs Gray on 31 March 1911—but this was the period of the Gray/Bather/Reed controversy. Schuchert's complaint that his museum duties interfered with his research and that as a result, instead of a monograph, he had had only sufficient time to prepare descriptions of the genera and their species, ought to have provided some support for Bather's position.

34. **W. K. Spencer** see *Biogr. Mem. Fell. Roy. Soc., Lond.* **2**, 1956: 291–9; and Cleevely, 1983: 273.

35. **Wheelton Hind** FGS (1860–21 June 1920). Eminent medical practitioner, who lived at Stoke-on-Trent, Staffs. His research un-ravelled the succession of Carboniferous rocks in North Staffs. and produced the standard monograph on the *British Carboniferous Lamellibranchia* (1896–1905). *Q.Jl. geol. Soc.*, Lond. **73**, 1917: lvii–xlix; **77**, 1921: lxviii–lxix.

36. **T. H. Withers**. BMNH: Boy Attendant, 1898; Assistant, 1925; Curator, Fossil Cirripedia 1925–44. *Proc. Geol. Soc.* Lond., No. 1515, 1954: cxliii–cxliv.

37. Withers declined to deal with further machaeridian specimens offered by Alice Gray (14 May 1934) since he had to devote all his time to the preparation of a *Catalogue of Cretaceous Cirripedia*.

38. For some reason, Bather always appears to have been ultra critical of J. R. Gregory's nomenclature and frequently expressed these views in print beginning with a letter (1897: 381), see also a paper on *Eocidaris* (1909). This antipathy towards Gregory may have been due to his sudden emigration to Australia in 1901, having spent much of his tenure at the BMNH on field-work, leaving Bather with additional responsibilities. However, it was very probably the result of Gregory's careless scientific work!

39. Dr Bather makes occasional references to seeing Mrs Gray on his visits to Edinburgh; see reference to his son's pleasure at Mrs Gray's interest in 'Rugger' (letters September 1921).

4. BATHER

40. W. D. Lang. 1934. Francis Arthur Bather (1863–1934).
Obit Not. Roy. Soc., London, No. **3**: 303–314;
1934. Dr. F. A. Bather, FRS.
Nature, **133**, (31 March 1934): 485–86

41. In addition of Lang's references, there are indications of Bather's relationship with his staff and other professional colleagues in the various contributions made to the tribute published in the *Museums Journal*, **34**: 41–45.

42. P. E. Raymond, 1935. Memorial of F. A. BATHER. *Proc. Geol. Soc. Amer.* 1934: 173–186, portr., bibliogr.

43. Bert Hansen in his article in the *Dictionary of Scientific Biography* **2**: 507 has emphasized Bather's use of the natural world to his fossil studies.

44. Bibliography: the only published bibliography Raymond (1935) is incomplete; this had been prepared by Withers at Raymond's request. Apparently, Bather had distributed his own list in 1915, but did not extend this further. My own [RJC] list comprises **258** publications: 18 of which were reviews and only 7 of which dealt with Gray material. It is worth noting that Bather did not publish anything at all in 1921, the year he was dealing with the acquisition of Mrs Gray's material.

On Echinodermata	= 43	Stratigraphy	= 9
Crinoids	= 67	Museology/Techniques etc.	= 42
Edrioasteroids	= 10	Taxonomy/Nomenclature	= 19
Cystoids	= 7		70
	127		
		Obituaries	= 8
Other Phylla (mainly Palaeozoic)		Bibliography	= 7
	= 46		15
	173		

45. Although Bather made frequent mention of his involvement in producing a Catalogue of the Cystoids & Crinoids for the BM material, this was never completed. The only evidence for this work is a series of printed/mss index cards now dispersed throughout the main reference collections of these groups in the Dept. of Palaeontology.

46. Aware of his reduced vigour, and knowing the customary slow rate of progress within the Museum, Bather felt that he would be able to achieve very little in his remaining four years before retirement.

47. Bather's involvement in local affairs is reported in his obituary published in the *Wimbledon Borough News*, 23 March 1934.

48. See Letters from Margaret Grant dated 9 January 1935 & 12 January 1935. She refers to 'that Lonely Intelligence' and also to the fact that he was known to them as 'the Dominie'.

5. BATHER/GRAY CORRESPONDENCE

49. Her daughter Alice, on the other hand, understood that Bather's museum duties prevented him from attending to their queries; see her letter of 22nd Feb. 1925.

50. Bather (16 January 1899) 'Your two specimens arrived safely ... but there was **no light** available for their examination till this morning.'
Stearn (1981: 213) quoted Riley's account of conditions at the BMNH in 1911, which mentioned that Electricity had been installed in the office studies in 1906.

51. A. S. Woodward, *History of the Collections in the BMNH*, p. ii of the Preface and the MSS. Annual Report on Bather's work for 1904 indicate that he was involved in its compilation during this period. The correspondence file with FRC Reed also shows that he was also engaged in dealing with material from Burma (at least 16 letters).

52. Starfish Bed. 'encouragement to preserve every fragment' Bather letter (4 October 1907)

53. It must be realised that 'cystids' for Bather at that time would have included forms that would now no longer be called cystids, or cystoids, and have since been referred to chordates (see discussion of Jefferies p. 218).

54. This expression '*in fear & trembling*' occurs in another letter (20 January 1897) written a few years earlier by Mary Kingsley to Albert Günther, a former Keeper of Zoology at the BMNH, when she submitted an advance copy of her book *Travels in West Africa* seeking a positive verdict for its publication.

55. Bather (1908: 76) referred to another aspect of this problem:

> I am constantly favoured by correspondents with specimens for which they desire a name. Unfortunately, ... it is impossible to name them without spending more time in their preparation than we ... can spare! I ... point out ... that it is our duty ... to name and arrange the specimens already in the museum. Consequently, unless our correspondents give us all possible help in the preliminary preparation of their specimens, they cannot hope for very satisfactory replies.

As one of the more enlightened palaeontologists of his time, Bather went on to vent his exasperation at those who 'seem only anxious to load science with a new species and a new name ... they do not trouble about the lessons the fossil can teach!'.

56. This is a reference to the monograph *Stammesgeschichte der Pelmatozoen. Erster Band. Thecoidea und Cystoidea*. 1899: x = 442 pp., 18 pls. published in Berlin by Otto Jaekel as part of his synthesis of existing knowledge of fossil Crinoidea.
Jaekel, a vertebrate palaeontologist, became Professor at Berlin (1890–1903), Vienna (1903), Greifswald (1904–28 and Pekin (1928). The 1899 work on the Cystoids is one of his most significant contributions to palaeontology. Apparently, Jaekel's work was either extremely thorough and of high quality, or else hastily put together, not particularly clear, superficial and of little real value. Although even these cursory papers have value, for in one he set up the Class Carpoidea (pers. commun. Dr R. P. S. Jefferies).

57. Part of Bather's reply to the Geological Society when presented with their Lyell Medal, *Proc. Geol. Soc.*, Lond. **67** (1911): xlv.

58. On the basis of their correspondence between 1892–1925, Bather and Reed maintained a friendly working relationship, assisting one another with identifications, providing material for research and collaborating in the preparation of papers.

59. In addition to the details provided by Stearn, Dr Bather makes several references to the situation in his correspondence, eg. see letters in Gray Correspondence of January 1918.

60. This is presumed to be a reference to the specimen of *Archaeopteryx lithographica* Meyer found in the Upper Jurassic Lithographic Limestone of a quarry near Pappenheim in Bavaria. It was purchased by the Museum from Dr Karl Haberlein in 1862 together with other material in his collection. As an 'intermediate' between reptiles and birds this fossil has been the subject of repeated investigation, and has recently been the subject of a wholly unjustified accusation of 'fakery'.

    An exhibition at the BMNH during 1987–88 demonstrated the scientific evidence for its authenticity, showing that its essentially reptilian skeleton had several avian features as well as the distinct impressions of feathers. (see Ostrom, J. H., 1984 *In*; *Proceedings of the International Archaeopteryx Conference*, Eichstatt, 1984: pp 9–19).

61. Air-raids: FRC Reed in a letter to Bather (15 September 1917) asked that some figured cystids belonging to the Geological Survey of India should be insured with Lloyds for £250 against the 'risk of air-craft' whilst they are at the BMNH; he explains that he always takes out insurance against fire & now air-craft when he borrows other people's fossils. After being told by the Director (26 September) that no funds were available for such a course, Bather eventually returned the specimens (26 November) to the relative safety of Cambridge.

6. ACQUISITION

62. Donations of 1867, 1868 & 1869 recorded in Hunterian Museum register GU Catalogue A numbers 30–89; other donations made in 1870, 1872 and 1873.

63. Smith-Woodward had annotated her previous letter with the comment 'Trustees . . . will not consider it until after the war—so time to think over proposal'.

64. The basis of Dr. Bather's calculation as to the value of material in the Gray Collection was as follows:

		at £1
Type material of New species		
Type specimens of New Varieties	@	0–10–0
Figured specimens	@	0– 5–0
Specimens selected as Gray Coll'n	@	2–0
according to the character	@	1–6
of the group	@	1–0
Duplicate/or Un-examined specimens	@	1–0
or	@	0–6d

65. One wonders how much money the Grays would have spent travelling to Girvan over the years and in staying with relatives in the area?

66. This refers to W. Lewis Abbott material from the Ightham Fissure pres'd by Sir H. Howarth to British Museum.

67. The Gray's kept a detailed record of the despatch of each consignment and the cost of carriage, which was used to settle their account. 68 boxes were despatched to the BMNH according to their records. This book was presented to the BMNH by Alice Gray (2 June 1940) and is now kept with the Gray Mss in the Palaeontology Library. In this context, it should be noted that the BMNH paid for the carriage of all the material it acquired in 1920's, 1937 and 1945. The costs for the despatch of other material sent by the Gray family to various specialists over many years must also have amounted to a reasonable sum.

68. 1st payment of £850 received on 15 July 1920; 2nd payment of £518 (incl. carriage) on 10 March 1921; 3rd payment of £800 on 8 July 1921; final amount of £100 on 9 March 1922; with various amount for carriage ending with that on 24 March 1922.

69. W. K. Spencer apparently had seen all the starfish & echinoderm material; F. R. C. Reed had been sent any trilobites and brachiopods that members of the family thought were new; & Archie Lamont had looked over the gastropods.

70. Lang arranged (22 April 1937) for R. H. Spires and an assistant Mr Covington, to visit Edinburgh and pack the collection; Alice Gray (4 May 1937) wrote: '... packing completed with minimal inconvenience. Mr. Spires most kind & considerate'.

71. Sedgwick Museum, Cambridge. Donations made by Mrs Robert Grey: Trilobites in 1907; Brachiopods & Rostroconchs in 1908; Machaeridians in 1909; Hyolithids and Machaeridians in 1910. The BMNH presented duplicates of the algae *Mastopora fava* (Salter) in 1941.

72. Amongst the material presented in 1937 was at least one specimen mentioned by Reed much earlier—the only illaenid *librigena* from the Stinchar Limestone, Minuntion (Reed, 1904). This is of significance in extending the type series beyond that of the original purchase. [R. Tripp]

73. Letter from Davidson & Syme, Edinburgh (2 December 1944) to W. N. Edwards in E. H. Gray file.

7. GIRVAN FAUNA

74. Bluck (1985) considered the relationships of the Girvan sequence to the probable accretionary prism of the Southern Uplands in his examination of the tectonic history of the Caledonides in a wider context. *Scott J. Geol.* **21**: 437–464

75. James Nichol (1844) *Guide to the Geology of Scotland*, Edinburgh. see p. 261 for list of seven species: 1 sponge, 3 brachiopods, 1 pteropod.

76. An anecdote told in a letter (To Fanny Hicks, 21 August 1848) concerning Sedgwick's visit in 1848, indicates that many of these specimens were gathered by a young girl, who had first shown them the quarry near Girvan, at a cost of 1d each, see Clark & McKenny Hughes, 1890 *The Life and Letters of the Rev'd. Adam Sedgwick*, Vol. 2: 145.

77. F. W. M'Coy.
1851. On some New Silurian Mollusca. Pt. 1. *Ann. Mag. nat. Hist.* **7**: 45–63. *Orthoceras poltum* (M'Coy) from Glenwhapple; *Bellerophon subdecussatus* (M'Coy) from Mulloch; *Trochus Moorei* (M'Coy) from Dalquharran.
On some New Silurian Mollusca. Pt. 2. *Ann. Mag. nat. Hist.* **7**: 387–409. *Hemithyris angustifrons* (M'Coy)—Mulloch Hill; *H. nasuta* (M'Coy)—Craighead Quarry; *Orthisina scotica* (M'Coy)—Craighead; *Holopella cincta* (M'Coy)—Mulloch.
1852. On New lower Palaeozoic Mollusca. *Ann. Mag. nat. Hist.* **10**: 189–195 *Murchisonia cancellata* (M'Coy)—Mulloch; *M. simplex* (M'Coy)—Craighead; *Eccliomphalus scotica* (M'Coy)—Mulloch.

78. Sedgwick, A. & M'Coy, F. W. 1855. *A Synopsis of the Classification of the British Palaeozoic Rocks*, with a systematic description of the British Palaeozoic Fossils in the Geological Museum of the University of Cambridge.

79. **J. W. Salter** (1820–1869). Britain's leading Palaeozoic palaeontologist during his lifetime and a specialist on trilobites. He began his natural history career as an apprentice to James de Carle Sowerby—[and also married his daughter]. Salter also assisted both Murchison and Sedgwick and later trained the young Robert Etheridge.
Difficulties over his position and status, partly arising from family matters, his health and involvement with religion, led to his resignation from his position at the Geological Survey. (See Secord, J. A., 1985 *Spec. Publ. Soc. Hist. Nat. Hist.* **3**: 61–75)

80. Salter, J. W. 1855. List of some of the Silurian Fossils of Ayrshire. pp. 170–178 [17 brachiopods; 1 bivalve; 13 gastropods; 6 Cephalopoda] with Murchison, R. I. 'On the Silurian Rocks of the South of Scotland'. *Quart. Jl. geol. Soc.*, Lond. **7**: 139–169.

81. Of the earlier workers [= describers], it would appear that only Nicholson and Etheridge had ever visited the Girvan District to make their own collections and observations. Virtually all

post-1950 publications have been written by geologists with a good field knowledge of the area and its formations.

82. Rough estimates of the Total number of Girvan species at each phase are: 1st 'exploratory' phase = 40, [7; 34; 37 species]; 2nd 'accumulative/acquisitive' phase = 560 [see list in Peach & Horne]; 3rd 'interpretative' phase = *c.* 700.

83. To explain the presence of both internal and external moulds in many of these specimens, Goldring & Stephenson (1972) have suggested that several of the Girvan 'echinoderms' were sediment-eaters and that the distortion of the moulds was compatible with measurements made on the modern *Echinocardium cordatum* showing that 30% of its test is occupied by gut contents.

84. *Glyptocrinus globularis* N. & E. 1881.

85. Ramsbottom recorded the following species from the Girvan district: *A. thraivensis*, *A. drummockensis*, *C. heterobranchia*, *C. gracilis*, *D. granditubus*, *P. scoticus*, *Protaxocrinus girvanensis*, *M. cirrifer*, *X. multiramus*, *X.* sp., *A. elevatus*, *D. craigheadensis*, *D. globularis*.

86. The term 'calcichordate' is now thought to be inappropriate (see Jefferies *et al* 1987: 432).

87. Letter 14 June 1912.

88. See p. 224 for an account of Mrs Gray's strong feelings for her cystids.

89. Girvan Rostroconch molluscs have been figured in Pojeta & Runnegar (1976: 54); no British author has dealt with the monoplacophorans from Girvan, although Hind and Reed did describe *Tryblidium* species as bivalves.

90. In his review of Ordovician pelecypods [= bivalves], Pojeta (1971) has explained that another reason is the mistaken belief that adequate material is not available, since the majority of Ordovician specimens are in the form of poorly preserved moulds and casts, which are only found on exposed limestone and sandstone surfaces. His review also provides other information on the motives and results of earlier workers on Palaeozoic bivalves.

91. Extract from Biography by Alice Gray [see Gray Correspondence, Vol. 1, 'letter' No. 23]:

> The letter from my mother to Professor Lapworth (20 November 1898) and his reply (29 November 1898), are of importance because they show that the 'Starfish Bed' known to-day [*c.* 1938] is not the Starfish Bed described by him on p. 619 of the 'Girvan Succession'. I think I am correct in stating that Professor Lapworth did not visit the Girvan District after my mother found her 'Starfish Bed' and that he never saw her 'Starfish Bed'.
>
> It ought, perhaps, to be placed on record that we, as a family, searched in vain for Professor Lapworth's Starfish Bed in 'an old quarry'; also that the owner of South Threave Farm at the time, Mr Paterson, did not know of any old quarry, on either his own property or on neighbouring land, answering to the description . . . although he knew Prof Lapworth and saw him occasionally when working . . . the . . . geology of the Girvan District

Alice Gray also expressed doubts over any suggestion that nearby overgrown depressions could once have been Lapworth's 'quarry' for the family had frequently worked in that neighbourhood and would have found the site.

92. Reed's monograph on the Girvan trilobites (1903–6, 1914) and Bather's work on the Cystoids deal mainly with Starfish Bed material; Cocks (1978) in his review of Davidson's brachiopods records more than 30 species from the Bed; and Jefferies (1986: 192)) referred to the two species of cornutes that have frequently been preserved as the 'youngest cornutes known'.

8. CONCLUSIONS

93. The Edinburgh Census return for 1891 records 1 domestic servant in the household; in the census returns for 1851 and 1861 her father's household at Girvan included several servants, but only one in each census was listed as a house servant, the others were also farm labourers, or dairymaids.

94. Mrs Gray in a letter to Davidson (2nd Nov. 1876):

> . . . from what I hear from our Scotch geologists, it still seems an open question whether the position, or sequence of the Girvan Beds is really determined.

95. Letter to 'Rosie' dated 13 November 1921 in the Royal Scottish Museum, Edinburgh; apparently in answer to a reference concerning certain books, probably by Mrs Asquith in the light of the following comment.
Mrs Gray wrote: 'We are all sick of Mrs Asquith!' and went on to mention a clever burlesque in *Punch* of one of her books published under the heading 'A brilliant Little Innocent Abroad'.

96. Mrs Gray's reply to the suggestion of Dr Traquair *c.* 1878–80 (see p. 4 of Alice Gray's Mss biography of her mother)

97. See letters to Bather dated 23 November & 17 December 1910 re borrowing Jaeckel's work on cystideans; and Bather's letter 31/7/1900 advising her to refer to Lankester's *Treatise on Zoology*.

98. Her visits to Prague and BMNH referred to in Bather correspondence (24 July 1907).

99. Bather's letter (22 June 1919) is in response to Mrs Gray's questions as to the function of some unusual crinoid ossicles that she had found at Craighead.

100. 30 October 1876, puzzled over the difference in ornamentation shown by a large *Lingula* occurring at Balclatchie from others found at Craighead.

101. *Orthis calligramma* Dalman (see her letter of 11 February 1882); the material has since been recognised as *Orthambonites playfairi* (Reed), *Hesperorthis craigensis* (Reed) and *Dolerorthis* ? sp.
Among other examples is *Strophomena corrugatella* Davidson which included several unrelated brachiopods that had independently developed strongly wrinkled ornament; these are now described as: *Gunnarella corrugatella* Davidson, *Gunnarella undulata* (M'Coy); *Rafinesquina* sp., *Palaeostrophomena kilbuchoensis* (Davidson); *Ptychoglyptus* ? sp., *Leptostrophia jamesoni* (Reed).

102. The old gutta percha rubbers used to produce casts of the Girvan fossils for Bather and Spencer have been replaced by silicone and latex rubbers, which are far more fluid and flexible, allowing more of the finer details of ornament to be reproduced. It is also hoped that such materials will provide more permanent replicas.

103. See the recent work of Jefferies on cornutes; Donovan on crinoids; and Paul on cystoids.

104. **Walter R. Billings** (?–1920). An amateur fossil collector in Canada, who was particularly interested in crinoids. He worked in the Chief Architects Office, Ottawa and was able to obtain material from various new fossil sites as they were discovered during excavations. He corresponded with Bather about fossil echinoderms from 1890 to 1916; lent most of his better specimens for description; provided the 'gossip of a superficial amateur' (see letter 14 May 1897) and acted as a reporter, mediator and link for Bather with specialists throughout North America. Biogr. reference in *Geol. Mag.* **57**, 1920: 287–288. The file 'WR Billings' in the BMNH Correspondence Archive has 56 letters from him with 13 draft replies from Bather.

105. The correspondence with Dr Bather contains many references to: 'my fossil', 'my cystids', 'my crinoids' etc.

106. described by Alice Gray in a letter to L. F. Bairstow (10 October 1938)

107. Davidson's quotation in the *Geologist*, Vol. II, 1859: 461.

108. Alice Gray's letter (16 October 1937) indicates that this may have been unfortunate and the wrong person commemorated, as the specimen had been found by her sister Agnes Gray!

11. REFERENCES

Papers that mention Mrs Gray and/or her collection are marked with an asterisk *

Alexander, A. S. 1939. *Across Watersheds*. viii + 278 pp, 4 pls. Robert Maclehose & Co. Ltd., Glasgow.

Allen, D. E. 1976. *The Naturalist in Britain. A Social History*. xii + 292 pp. Allen Lane, London.
* **Armstrong, J., Young, J., & Robertson, D.** 1876. *Catalogue of the Western Scottish Fossils*. iii + 164 pp. Blackie & Son, Glasgow.
* **Bather, F. A.** 1913. Caradocian Cystidea from Girvan. *Transactions of the Royal Society of Edinburgh* **49**: 359–530, 6 pls., 80 text figs.
* —— 1915. Studies in Edrioasteroidea, VI. *Pyrgocystis* n.g.. *Geological Magazine*, London Dec. VI, Vol. II, **52**: 5–12; 49–60, pls. 2 & 3.
* —— 1923. The shell of *Cornulites*. *Geological Magazine*, London **60**: 542–5.
* —— 1925. *Cothurnocystis*. A study in adaptation. *Paläontologische Zeitschrift* Berlin **7**: 1–15.
—— 1926. Preface, pp v-xi. *In* Withers, T. H. (1926) *Catalogue of The Machaeridia . . . in the Department of Geology*. British Museum (Natural History), London.
* **Bather, F. A. & Spencer, W. K.** 1934. A new Ordovician echinoid from Girvan, Ayrshire. *Annals and Magazine of Natural History* (10) **13**: 557–558.
Begg, J. L. 1946. Some new fossils from the Girvan district. *Transactions of the Geological Society of Glasgow* **21**: 29–47.
Benton, M. J. 1979. H. A. Nicholson (1844–1899), invertebrate palaeontologist: bibliography and catalogue of his type and figured material. *Royal Scottish Museum, Information Series, Geology* **7**: vii + 94 pp.
Bluck, B. J. *1985. The Scottish paratectonic Caledonides. Scottish Journal of Geology* **21**: 437–464.
Brenchley, P. J. 1984. Late Ordovician Extinctions and their Relationship to the Gondwana Glaciation, pp 291–335. In Brenchley, P. J. (Ed.), 1984 *Fossils and Climate* 352 pp. John Wiley & Sons Ltd., Chichester.
Brower, J. C. 1974. Upper Ordovician Xenocrinids (Crinoidea, Camerata) from Scotland. *Palaeontological Contributions. Papers University of Kansas Ps*, **67**: 1–25, 3 pls.
* **Brookes Knight, J.** 1941. *Palaeozoic Gastropod Genotypes. Special Papers. Geological Society of America* **32**: vi + 510 pp, 96 pls.
* **Clarkson, E. N. K.** 1985. A history of Scottish palaeontology 1834–1984. *Scottish Journal of Geology* **21** (4): 389–406.
* **Clarkson, E. N. K. and Tripp, R. P.** 1981. The Ordovician trilobite *Calyptaulax brongniarti* (Portlock). *Transactions of the Royal Society of Edinburgh (Earth Sciences)*, Edinburgh, **72**: 287–294, 6 figs.
Cleevely, R. J. 1983. *World Palaeontological Collections* 364 pp. British Museum (Natural History)/Mansell Publishing Ltd., London.
* **Cocks, L. R. M. C.** 1978. A Review of British Lower Palaeozoic Brachiopods, including a Synoptic Revision of Davidson's Monograph. *Palaeontographical Society, (Monographs)*, 256 pp.
Cocks, L. R. M. & Toghill, P. 1973. The biostratigraphy of the Silurian rocks of the Girvan District, Scotland. *Quarterly Journal of the geological Society*, London **129**: 209–43.
Curry, G. B., Bluck, B. J., Burton, C. J., Ingham, J. K., Siviter, D. J., and Williams, A. 1984. Age, evolution & tectonic history of the Highland border Complex, Scotland. *Transactions of the Royal Society of Edinburgh, Earth Sciences* **75**: 113–133.
* **Davidson, T.** 1853–1883. Monograph of the British Fossil Brachiopoda. *Palaeontographical Society, (Monographs)*, 1–368, 42 pls.; Suppl.: 242 pp, 17 pls. [for details see Cocks, L. R. M. C. (1978)]
* —— 1877. Notes on four species of Scottish Lower Silurian Brachiopoda. *Geological Magazine*, London, Dec. II, Vol. **4**: 13–17, pl. 2.
* **Dean, W. T.** 1966. The lower Ordovician startigraphy and trilobite fauna of the Landeyran Valley and the neighbouring district of the Montagne Noire, south-western France. *Bulletin British Museum (Natural History)*, Geology **12**: 245–343, 21 pls.
Dewey, J. F. 1982. Plate tectonics and the evolution of the British Isles. *Journal of the Geological Society*, London, **139**: 371–412.
* **Donald, J.** [see also under Longstaff, Mrs. J.] 1899 Remarks on the genera *Eotomaria* Koken and *Hormotoma* Salter with description of British species. *Quarterly Journal geological Society*, London **55**: 251–272, pls. 21–22.
* —— 1902. On some of the Proterozoic Gasteropoda which have been referred to *Murchisonia* and *Pleurotomaria* with descriptions of new subgenera and species. *Quarterly Journal geological Society*, London **58**: 313–339, pls. 7–9.

* —— 1905. Observations on some of the Loxonematidae, with descriptions of two new species. *Quarterly Journal geological Society*, London **61**: 564–6, pl. 37.
* —— 1906. Notes on the genera *Omospira*, *Lophospira*, and *Turritoma*: with descriptions of the new Proterozoic species. *Quarterly Journal geological Society*, London **62**: 552–572, pls. 43–44.
* **Donovan, S. F.** 1983. Tetrameric crinoid columnals from the Ordovician of Wales. *Palaeontology* **26**: 845–9, 2 t.-figs.
* —— 1986. Pelmatozoan columnals from the Ordovician of the British Isles. Pt. 1. *Palaeontographical Society, (Monographs)*, 11–68, 6 pls.
—— *In Press*. Pt. II.
* **Elles, G. L. and Woods, E. M. R.** 1901–1918. *A Monograph of the British Graptolites. Palaeontographical Society, (Monographs)*, pp a-m, [2], clxxi + 539 pp, 52 pls.
* **Etheridge, R.** (Jnr.) 1878. Notes on Silurian fossils from the neighbourhood of Girvan, Ayrshire. *Proceedings of the Royal Society of Edinburgh* **4**: 164–177.
* —— 1881. The Palaeozoic Conchology of Scotland. *Proceedings of the Royal Physical Society of Edinburgh* **7**: 1–94.
Flett, Sir J. Smith. 1937. *The First Hundred Years of the Geological Survey of Great Britain*. 280 pp. H.M.S.O., London.
Fortey, R. A. 1984. Global earlier Ordovician transgressions and regressions and their biological implications. pp 37–50 *In* Bruton, D. L. [Ed.] 'Aspects of the Ordovician System', *Palaeontological Contributions University of Oslo* **295**: [vii] + 228 pp.
Freshney, E. C. 1959. An extension of the Silurian succession in the Craighead Inlier, Girvan. *Transactions of the Geological Society of Glasgow* **24**: 27–36.
Gibson, J. A. 1981. Regional Checklist of Clyde Birds. Second edition. Clyde Area Branch Scottish Wildlife Trust, Glasgow.
Gislen, T. 1930. Affinities between the Echinodermata, Enteropneusta and Chordonia. *Zoologiska Bidrag Uppsala* **12**: 199–304.
Goldring, R. & Stephenson, D. G. 1972. The depositional environment of three Starfish Beds. *Neues Jahrbuch für Geologie und Paläontologie, Monatshefte* **1972**: 449–64.
* **Gray, R.** 1868*a*. Specimens exhibited 29th Sept. 1864. Observations on various branches of Natural History during the past summer. *Proceedings of the Glasgow Natural History Society* **1**: 100–101.
* —— 1868*b*. Specimens exhibited 28th Nov. 1865. Notes on Silurian fossils [brachiopods] from Girvan. *ibid.*: 124.
* —— 1868*c*. Specimens exhibited at meeting 7th Jan. 1868. Occurrence of *Ischadites kanigi* [sic] in the Silurian rocks of the Girvan District. *ibid.*: 197–8.
* —— 1869. Specimens exhibited 27th Oct. 1870. Note on a new Silurian brachiopod, *Leptaena Youngiana* Davidson (non Gray), from the Girvan District; and also the occurrence of *Leperditia* in the district. *ibid.* **2** (1): 229–30.
Gray, R. and Anderson, R. 1869. On the Birds of Ayrshire and Wigtownshire. *Proceedings of the Glasgow Natural History Society* **1**: 269–324.
* **Harper, D. A. T.** 1979. The environmental significance of some faunal changes in the Upper Ardmillan succession (upper Ordovician), Girvan, Scotland. pp. 439–445 *In* Harris, A. L., Holland, C. H. & Leake, B. E. (Eds.) 'The Caledonides of the British Isles—reviewed'. *Special Publication Geological Society of London* **8**: xii + 768 pp, Scottish Academic Press Ltd., Edinburgh.
—— 1981. The stratigraphy and faunas of the Upper Ordovician High Mains Formation of the Girvan District. *Scottish Journal of Geology*, **17**: 247–255.
—— 1982*a*. The late Ordovician Lady Burn Starfish Beds of Girvan. *Proceedings of the Glasgow Geological Society*, No. 122/123: 28–32.
—— 1982*b*. The stratigraphy of the Drummuck Group (Ashgill), Girvan. *Geological Journal* **17**: 251–277.
* —— 1984. Brachiopods from the Upper Ardmillan Succession (Ordovician) of the Girvan District, Scotland. Part. 1. *Palaeontographical Society (Monographs)*, 1–78, 11 pls. [Publ. No. 565, part of Vol. 136 for 1982].
* **Hind, W.** 1910. The Lamellibranchs of the Silurian rocks of Girvan. *Transactions of the Royal Society of Edinburgh* **47**: 479–548, 5 pls.
Horne, J. 1904. Obituary of R. H. Traquair. *Proceedings of the Royal Society, Edinburgh* **33**: 4.

—— 1925. Obituary of Mrs Robert Gray. *Transactions of the Geological Society, Edinburgh* **11**: 392.

* **Howells, Y.** 1982. Scottish Silurian Trilobites. *Palaeontographical Society (Monographs)*, 76 pp., 15 pls.

* **Hughes, C. P., Ingham, J. K. & Addison, R.** 1975. The morphology, classification and evolution of the Trinucleidae (Trilobita). *Philosophical Transactions of the Royal Society of London* **B 272**: 537–607.

Ince, D. 1984. Sedimentation and tectonism in the Middle Ordovician of the Girvan district, S. W. Scotland. *Transactions of the Royal Society of Edinburgh (Earth Sciences)* **75**: 225–237.

* **Ingham, J. K.** 1968. British and Swedish Ordovician species of *Cybeloides* (Trilobita). *Scottish Journal of Geology* **4**: 300–316, pls. 1, 2.

—— 1978. Geology of a continental margin: 2: middle and late Ordovician transgression, Girvan. *In* Bowes, D. R. & Leake, B. E. (Eds.) *Crustal evolution in northwestern Britain and adjacent areas. Geological Journal (Special Issue)*, **10**: 163–176.

Jaanusson, V. 1984. What is so special about the Ordovician? pp 1–3. In Bruton, D. L. (Ed.) 1984. *Aspects of the Ordovician System. Palaeontological Contributions University of Oslo* No. 295: [vii] + 228 pp, Oslo Universitet.

* **Jefferies, R. P. S.** 1967. Some fossil chordates with echinoderm affinities. *Zoological Society of London*, Symposium, **20**: 163–208.

* —— 1968. The subphylum Calcichordata (Jefferies, 1967)—primitive fossil chordates with echinoderm affinities. *Bulletin British Museum (Natural History)*, Geology **16**: 243–339.

* —— 1986. *The Ancestry of the Vertebrates*, 300 pp, illus. British Museum (Natural History), London.

Jefferies, R. P. S. & Lewis, D. N. 1978. The English Silurian fossil *Placocystites forbesianus* and the ancestry of the vertebrata. *Philosophical Transactions of the Royal Society of London* **(B) 282** (990): 205–323.

Jefferies, R. P. S., Lewis, M. & Donovan, S. K. 1987. *Protocystites menevensis*—A stem group chordate (Cornuta) from the Middle Cambrian of South Wales. *Palaeontology* **30**: 429–484, pls. 54–60.

* **Jones, O. T.** 1928. *Plectambonites* and some allied genera. *Memoirs of the Geological Survey of Great Britain, Palaeontology*, London. Vol. **1**(5): 367–527, pls. 21–25.

* **Jones, T. R.** 1886. On the genus *Beyrichia* and some new species. *Annals and Magazine of Natural History* (5) **17**: 337–63, pl. 12. [Gray Coll'n p. 356]

* —— 1893*a*. On some Palaeozoic Ostracoda from the Girvan District of Ayrshire. *Quarterly Journal geological Society*, London **49**: 296–307, pls. 13 & 14.

* —— 1893*b*. On some Palaeozoic Ostracoda from the Girvan District of Ayrshire. *Geological Magazine*, London, Dec III, vol. 10: 285 [A report of above paper].

* **Jones, T. R. & Woodward, H. 1895.** On some Palaeozoic Phyllopoda. *Geological Magazine*, London, Dec. IV, vol. 2: 539–45, pl. 15.

* **Lamont, A.** 1934. Lower Palaeozoic Brachiopoda of the Girvan District: Suggestions on Morphology in relation to Environment. *Annals and Magazine of Natural History* (10) **14**: 161–84. [Gray Coll'n ref'd. p. 183].

* —— 1935. The Drummuck Group, Girvan: A Stratigraphical Revision, with Descriptions of New Fossils from the Lower Part of the Group. *Transactions of the Geological Society of Glasgow* **19**: 288–334, pls. 7–9. [Gray Coll'n. ref'd. p. 291]

* —— 1946. Lamellibranchs from the Lower Drummuck Group (Ashgillian), Girvan, Scotland. *Cement, Lime and Gravel* **20**: 364–6, 1 pl.

* **Lane, P.** 1971. The British Cheiruridae (Trilobita). *Palaeontographical Society, (Monographs)*, 195 pp, 16 pls. [Makes no reference to Gray Coll'n. at all, although the material dealt with had originally been described by Reed]

Lapworth, C. 1878. The Moffat Series. *Quarterly Journal Geological Society*, London **34**: 24–343; 345–6.

* —— 1882. The Girvan Succession. *Quarterly Journal Geological Society*, London **38**: 537–666, Pls. 24–25.

* —— 1899. [Review of] The Survey Memoir on the Scottish Uplands. Mem. Geol. Surv. U.K. 'The Silurian Rocks of Britain. Vol. 1. Scotland'. *Geological Magazine*, London, Dec. IV, Vol. 6: 472–9; 510–20. [Gray coll'n. ref'd. p. 518].

1903. Presidential Address. *Quarterly Journal Geological Society*, London **59**: xlvii-xlviii.
Longstaff, (Mrs) J. [nee Donald] 1899. see under Donald
—— 1902. see under Donald
—— 1903. see under Donald
—— 1905. see under Donald
—— 1906. see under Donald
* —— 1924. Descriptions of Gasteropoda [sic] chiefly in Mrs Robert Gray's collection from the Ordovician and the Lower Silurian of Girvan. *Quarterly Journal Geological Society*, London **80**: 408–446, pls. 31–38.
* **MacBride, E. W. & Spencer, W. K.** 1938. Two New Echinoidea, *Aulechinus* and *Ectinechinus*, and an adult-plated Holothurian, *Eothuria* from the Upper Ordovician of Girvan, Scotland. *Philosophical Transactions of the Royal Society of London* Ser. B., Biological Sciences, **229** (No. 558): 91–136. [p. 92: This paper owes much to the careful collecting of the Misses Gray, who are continuing the work commenced by their mother.]
Macnair, P. & Mort, F. 1908. *History of the Geological Society of Glasgow*, 1858–1908, *with Biographical Notices of Prominent Members*. [viii] + 304 pp. Geological Society of Glasgow, Glasgow.
Mancenido, M. O. & Cocks, L. R. M. 1986. Thomas Davidson 1817–1885. *In* Racheboeuf, P. R. and Emig, C. [Eds.] 'Les Brachiopodes Fossiles et Actuels'. Actes du I^er^ Congres International sur les brachiopodes, Brest 1985. Biostratigraphie du Paléozoique, Univ. Bretagne Occidentale, **4**: 23–25.
* **Morris, S. F. & Fortey, R. A.** 1985. *Catalogue of the Type and figured specimens of Trilobite in the British Museum (Natural History)*, iv + 182 pp, 8 pls. British Museum (Natural History), London.
Morris, S. F. & Tripp, R. P. 1986. Lectotype selections for Ordovician trilobites from the Girvan District, Strathclyde. *Bulletin British Museum (Natural History*, Geology **40**: 161–76.
* **Nicholson, H. A. & Etheridge, R. (Jun.)** 1877. Contributions to micropalacontology—II. On *Prasporae Grayae*, a new genus and species of Silurian corals. *Annals and Magazine of Natural History* (4) **20**: 388–92.
* —— 1878–80. *A Monograph of the Silurian Fossils of the Girvan District in Ayrshire, with special reference to those contained in the 'Gray Collection'*. Blackwood & Sons, Edinburgh & London. Fasciculus I, (Rhizopoda, Actinozoa, Trilobita), 1878: ix + 1–135, pls. 1–19; Fasiculus II, (Trilobita, Phyllopoda, Cirripedia and Ostracoda), 1879: vi + 137–234, pls. 10–15; Fasciculus III, (The Annelida and Echinodermata, with Supplements on the Protozoa, Coelenterata, and Crustacea), 1880: vi + 235–341, pls. 16–24.
Nicol, James. 1844. *Guide to the geology of Scotland*, 272 pp. Oliver & Boyd. Edinburgh. [N.B. 2nd edit. 1864].
* **Owen, H. G.** 1965. The British Palaeozoic Asterozoa. Table of Contents, Supplement and Index. *Palaeontographical Society (Monographs), xii + 541–583 pp.*
* **Owens, R. M.** 1973. British Ordovician and Silurian Proctidae (Trilobita). *Palaeontographical Society (Monographs)*, 98 pp, 15 pls.
* **Paul, C. R. C.** 1965. On the occurrence of *Comarocystites*, or *Sinclaiocystites* (Paracrinoidea, Comarocystidae) in the Starfish Bed, Threave Glen, Girvan. *Geological Magazine*, London **102**: 474–7, pl. 20.
—— 1967. New Ordovician Bothriocidaridae from Girvan and reinterpretation of *Bothriocidaris* Eichwald. *Palaeontology*, London **10**: 525–541.
* —— 1973–84. *British Ordovician Cystoids*. Pt. 1.: Introduction etc. and Class Diploporita. *Palaeontographical Society (Monographs)* 1973: 1–64, 11 pls. Pt. 2.: Class Rhombifera. *Palaeontographical Society (Monographs)* 1984: 65–182, pls. 12–26.
* **Peach, B. N. and Horne, J.** 1899. *The Silurian Rocks of Britain. Part 1. Scotland. Memoirs of the Geological Survey of Great Britain, xviii + 749.* [More than 24 references to Gray Coll'n. in the Index; pp. 686–97 a 'List of Fossils prepared by Mrs. Gray from the collections made by her from the Silurian Rocks of the Girvan District']
* **Peach, B. N., Horne, J. and Macconochie, A.** 1901. The Silurian Rocks in the South of Scotland. *In* Elliott, G. F. Scott, Laurie, M. & Murdoch, J. Barclay, *Fauna, Flora and Geology of the Clyde Area*, British Association Handbook, Glasgow: pp 423–44. [Gray Coll'n. p. 428]
* **Peel, J. S.** 1975. *Arjamannia* a new upper Ordovician—Silurian pleurotomariacean gastropod from Britain and North America. *Palaeontology*, London, **18**: 385–390.

Pojeta, John 1971. Review of Ordovician Pelecypods. *Professional Papers U.S. Geological Survey* **695**: 46 pp, 20 pls.

* **Pojeta, J. & Runnegar, B.** 1976. The Paleontology of Rostroconch Mollusks and the Early History of the Phylum Mollusca. *Professional Papers U.S. Geological Survey* **968**: iv + 88 pp, 54 pls.

* **Ramsbottom, W. C. H.** 1961. A monograph of British Ordovician Crinoidea. *Palaeontographical (Monographs)*, 37 pp, 8 pls.

* **Reed, F. R. C.** 1903–1935. The Lower Palaeozoic Trilobites of the Girvan District, Ayrshire. *Palaeontographical Society (Monographs)*: Parts 1–3, 1903–6: 1–48, 6 pls.; 49–96, pls. 7–13; 97–186, pls. 14–20; Supplement 1, 1914: 56 pp, 8 pls; Supplement II, 1931: 30 pp; Supplement III, 1935: 64 pp, 4 pls.

* —— 1907. Sedgwick Museum Notes. Crustacea etc. from Girvan. *Geological Magazine*, London, Dec. V, Vol. **4**: 108–116, pl. 4.

* —— 1908*a*. Sedgwick Museum Notes. New fossils from Girvan, *Ischadites Königi* Murchison. *Geological Magazine*, London, Dec. V, Vol. **6**: 291–296, pl. 12.

* —— 1908*b*. The structure of *Turrilepas peachi* and its allies. *Transactions of the Royal Society of Edinburgh* **46**: 519–28, 1 pl.

* —— 1910. Lower Palaeozoic Hyolithidae from Girvan. *Transactions of the Royal Society of Edinburgh* **47**: 203–222, pls. 1–3.

* —— 1911. Sedgwick Museum Notes. A new fossil from Girvan. *Geological Magazine*, London, Dec. V, Vol. **8**: 337–9, pl. xv. [*Helminthochiton thraivensis*].

* —— 1912. Sedgwick Museum Notes. Notes on the Genus *Trinucleus*. Pts. 1 & 2. *Geological Magazine*, London, Dec. V, Vol. **9**: 346–53; 385–94; pls. 18, 19.

* —— 1914. Sedgwick Museum Notes. Notes on the genus *Trinucleus*. Pt. III. *Geological Magazine*, London, Dec. 6, Vol. **1**: 349–59, pls. 28, 29.

* —— 1917. The Ordovician and Silurian Brachiopoda of the Girvan District. *Transactions of the Royal Society of Edinburgh* **51**: 795–998, pls. 1–24.

* —— 1920–21. A Monograph of the British Ordovician and Silurian Bellerophontacea. *Palaeontographical Society, (Monographs)*, viii + 92 pp, 13 pls.

* —— 1923. New Fossils from Girvan [*Cornulites*]. *Geological Magazine*, London **60**: 268–276, pl. 12.

* —— 1924. Some New Ordovician and Silurian Fossils. [*Tryblidium girvanense*] *Geological Magazine*, London **61**: 25–31, pl. 3.

* —— 1925*a*. Some New Silurian Trilobites. *Geological Magazine*, London **62**: 67–76, pl. 2.

* —— 1925*b*. The Classification of the Acidaspidae. *Geological Magazine*, London **62**: 416–30.

* —— 1926. Some New Ordovician and Silurian Fossils from Girvan. *Transactions of the Royal Society of Edinburgh* **54**: 735–9, 1 pl.

* —— 1928. Notes on the Family Encrinuridae. *Geological Magazine*, London **65**: 51–77.

* —— 1931. A Review of the British Species of the Asaphidae. *Annals and Magazine of Natural History* (10) **7**: 441–472.

* —— 1935*a*. Some new brachiopods from Girvan. *Annals and Magazine of Natural History* (10) **16**:1

* —— 1935*b*. Palaeontological evidence of the age of the Craighead Limestone. *Transactions of the Geological Society of Glasgow* **19**: 340–72.

* —— 1940. New Ordovician Fossils from Girvan, Ayrshire. *Annals and Magazine of Natural History* (11) **6**: 154–69, pl. 8.

* **Regnell, G. & Paul, C. R. C.** 1981. Echinoderms from the Ordovician of the Girvan district, Scotland, with the description of two new species. *Transactions of the Royal Society of Edinburgh (Earth Sciences)* **72**: 49–56.

* **Rolfe, W. D. I.** 1981. *Septemchiton*—A Misnomer. *Journal of Paleontology* **55**(1): 675–678, 3 t.-figs.

Salter, J. 1855. List of some of the Silurian Fossils of Ayrshire. *Quarterly Journal of the geological Society of London* **7**: 170–178, pls. viii-x.

* **Shirley, J.** 1931. A redescription of the known British Ordovician species of *Calymene (s.l.)*. *Memoirs and Proceedings of the Manchester Literary and Philosophical Society* **75**: 1–33, 2 pls.

* **Sinclair, G. W.** 1949. The Ordovician Trilobite *Eobronteus*. *Journal of Paleontology*, Menasha, **23**: 45–56, pls. 12–14.

* **Slater, I. L.** 1907. A Monograph of British Conulariae. *Palaeontographical Society, (Monographs)*, [ii] + 41 pp, 5 pls.
* **Smith, A. B.** 1980. *Floridiscus girvanensis* a new Edrioasteroid from the Ordovician of Ayrshire. *Scottish Journal of Geology*, Edinburgh, **16**: 275–279.
* **Smith A. B. & Paul, C. R. C.** 1982. Revision of the class Cyclostoidea (Echinodermata). *Philosophical Transactions of the Royal Society of London, Ser. B, Biological Sciences* **296** (No. 1083): 577–684.
* **Smith, S.** 1930. The Calostylidae Roemer: A Family of Rugose Corals with Perforate Septa. *Annals and Magazine of Natural History* (10) **5**: 257–78, pls. 10–12. [Gray Coll'n. p. 265–6]
* **Spencer, W. K.** 1914–1940. A Monograph of the British Palaeozoic Asterozoa. *Palaeontographical Society (Monographs)*. 540 pp, 37 pls. [for further details see Owen, H. G. 1965]
* —— 1929. The Starfish of the Scottish Palaeozoic Beds. *Reports of the British Association*, Glasgow, **1928**. 550, 567, 655
Stearn, W. T. 1981. *The Natural History Museum at South Kensington*. A History of the British Museum (Natural History) 1753–1980. 414 pp Heinemann/BMNH British Museum (Natural History).
Strimple, H. Concerning Ordovician *Neoarchaeocrinus*. *Journal of Paleontology* **46**: 450–1, 1 t.-fig.
* **Teichert, C.** 1940. Cephalopoda from the Drummuck Group of the Girvan District. *Transactions of the Geological Society of Glasgow* **20**: 103–115, pls. 5 & 6.
* **Tripp, R. P.** 1954. Caradocian trilobites from mudstones at Craighead Quarry near Girvan, Ayrshire. *Transactions of the Royal Society of Edinburgh* **62**: 655–693, pls. 1–4.
* —— 1957. The trilobite *Encrinurus multisegmentatus* (Portlock) and allied Middle and Upper Ordovician species. *Palaeontology* **1**: 60–72, pls. 11, 12.
* —— 1958. Stratigraphical and geographical distribution of the named species of the trilobite superfamily Lichadacea. *Journal of Palaeontology* **32**: 574–582, pl. 85.
* —— 1967. Trilobites from the Upper Stinchar Limestone (Ordovician) of the Girvan District. *Transactions of the Royal Society of Edinburgh* **67**: 43–93, pls. 1–6.
* —— 1979. Trilobites from the Ordovician Auchensoul and Stinchar Limestones of the Girvan District, Scotland. *Palaeontology* **22**: 339–361, pls. 37–40.
* —— 1980. Trilobites from the Ordovician Balclatchie and lower Ardwells groups of the Girvan district, Scotland. *Transactions of the Royal Society of Edinburgh* **71**: 123–145, 4 pls. [other refs. 1962, 1965, 1976 also deal with Girvan taxa]
* **Tripp, R. & Howells, Y.** 1981. *Catalogue of the described, figured and cited Ordovician and Silurian Trilobites from the Girvan district, Scotland, in the British Museum (Natural History)*. 2 Microfiche: 6 pp, British Museum (Natural History), London.
Watts, W. W. 1939. The Author of the Ordovician System: Charles Lapworth M.Sc., LL.D., F. R. S., F. G. S. *Proceedings of the Geological Association*, London **50**: 235–286, 2 pls.
* **Whittard, W. F.** 1952. Cyclopygid Trilobites from Girvan and a note on *Bohemilla*. *Bulletin British Museum (Natural History)*, Geology **1**: 305–24, pls. 32, 33.
* **Whittington, H. B.** 1950*a*. A Monograph of the British Trilobites of the family Harpidae. *Palaeontographical Society, 55 pp, 7 pls.*
—— 1950*b*. Sixteen Ordovician genotype trilobites. *Journal of Paleontology*, Tulsa **24**: 531–565, pls. 68–75, 9 t.-figs.
* **Williams, A.** 1959. A Structural History of the Girvan District, S.W. Ayrshire. *Transactions of the Royal Society of Edinburgh* **63** (3) No. 27: 629–67.
—— 1962. The Barr and Lower Ardmillan Series (Caradoc) of the Girvan District, south-west Ayrshire. *Memoirs of the Geological Society*, London **3**: 1–267, 25 pls.
Williams, A., Strachan, I., Basset, D. A., Dean, W. T., Ingham, J. K., Wright, A. D., Whittington, H. B. 1972. A correlation of Ordovician rocks in the British Isles. *Special Report of the Geological Society*, London **3**: 74 pp.
Williams, A. & Wright, A. D. 1981. The Ordovician—Silurian bonndary in the Garth area of southwest Powys, Wales. *Geological Journal* **16**: 1–39.
* **Withers, T. H.** 1922. The 'Cirripedia' *Lepidocoleus* in the Upper Ordovician Rocks of Scotland. *Annals and Magazine of Natural History* (9) **9**: 653–56, pl. x.
* —— 1926. *Catalogue of the Machaeridia* (*Turrilepas* and its allies) *in the Department of Geology* xv + 99 pp, 8 pls. British Museum (Natural History).
Woodward, Henry. 1880. Notes on the Anomalocystidae, A remarkable family of Cystoidea found

in the Silurian rocks of North America and Britain. *Geological Magazine*, London, Dec. II, Vol. VII (No. V): 193–201.

* —— 1885. On a new species of *Helminthochiton* from the Upper Bala (Silurian) of Girvan, Ayrshire. *Geological Magazine*, London, Dec. 3, vol. 2: 352–8, pl. 9.

* **Young, J.** 1868*a*. Specimens exhibited 26 March 1867. Remarks on four species of Silurian Brachiopoda, new to Ayrshire. *Proceedings of the Glasgow Natural History Society* **1**: 169.

* —— 1868*b*. Specimens exhibited 31 March 1868. Note on a new brachiopod shell, *Triglesia [sic] grayiana* Davidson recently discovered in the Silurian strata of the Girvan valley, by Mrs Robert Gray. *ibid.*: 207.

* —— 1875*a*. Notes on the Genera of extinct Fossil shells, *Bellerophon* and *Porcellia*; their classification amongst the Mollusca, and their distribution in the Silurian and Carboniferous. *ibid.*: 16.

* —— 1875*b*. Specimens exhibited. 29 March 1870. Note on a small collection of Fossil Brachiopoda from the neighbourhood of Girvan. *Proceedings of the Glasgow Natural History Society* **2**: 21–22.

* —— 1876*a*. Specimens exhibited 3 October 1871. Notes on a series of fossils from the Silurian rocks of the Girvan Valley. *Proceedings of the Glasgow Natural History Society* **2**: 166. [general remarks on Gray Coll'n.]

* —— 1876*b*. Specimens exhibited 30 January 1872. Notes on a series of trilobites of Caradoc age from the Silurian of the Girvan Valley. *ibid.*: 179–180.

* —— 1876*c*. Specimens exhibited 26 March 1872. Note on a series of graptolites from the Silurian strata of the Girvan Valley. *ibid.*: 182–3.

* —— 1876*d*. Specimens exhibited 29 April 1873. Record of Crinoid remains from the Silurian of the Girvan district. *ibid.*: 216.

* **Young, (Professor) J.** 1868. Specimens exhibited 26 March 1876 On new forms of Crustacea from the Silurian rocks of Girvan. *Proceedings of the Glasgow Natural History Society* **1**: 169–173.

* —— 1875. Specimens exhibited 19 December 1870. Note on a new species of Crustacean, belonging to the genus *Solenocaris*, from the Silurian strata near Girvan, and on fragments, probably the appendages of a trilobite or Limuloid Crustacean. *Proceedings of the Glasgow Natural History Society* **2**: 66–7.

* —— 1876. Specimens exhibited 28 October 1873. Note on *Stenotheca* Salter, a Silurian Fossil from the Girvan district. *ibid.*, (2): 223.

APPENDIX 1

Letters between Mrs Gray and Thomas Davidson recorded in the Davidson's Letterbooks between 1847–1884

Letterbooks in Palaeontology Library Archives, British Museum (Natural History)

Period from 1st January 1847 to 19th May 1884

1.	1 January	1847 to 11 May	1848	15.	4 November	1864 to 27 March	1867
2.	11 May	1848 to 31 December	1849	16.	27 March	1867 to 20 April	1868
3.	2 January	1850 to 31 December	1850	17.	23 April	1868 to 16 April	1869
4.	2 January	1851 to 23 July	1852	18.	19 June	1869 to 3 June	1871
5.	23 July	1852 to 15 August	1853	19	9 June	1871 to 10 April	1872
6.	15 August	1853 to 17 November	1854	20.	10 April	1872 to 18 June	1873
7.	17 November	1854 to 7 December	1855	21.	24 June	1873 to 31 August	1874
8.	10 December	1855 to 19 September	1856	22.	2 September	1874 to 29 January	1877
9.	19 September	1856 to 10 October	1857	23.	29 January	1877 to 31 May	1878
10.	11 November	1857 to 20 August	1859	24	1 June	1878 to 4 October	1879
11.	20 August	1859 to 24 October	1860	25.	6 October	1879 to 21 November	1880
12.	27 October	1860 to 31 July	1862	26.	23 November	1880 to 29 November	1881
13.	7 August	1862 to 30 September	1863	27.	29 November	1881 to 3 July	1883
14.	2 October	1863 to 4 November	1865	28.	4 July	1883 to 19 May	1884

* These Letterbooks were bequeathed to the British Museum (Natural History) in 1886 with the Davidson's Library and Archive see Cleevely (1983–96), Cocks (1978–4)

Chronological summary of entries relating to Mrs Gray

DATE		FROM	DAVIDSON'S NOTE
25 January	1865	Mr J. Young	
5 March		Mr J. Young	
22 July		Robert Gray	
29 July		Robert Gray	
29 August		Robert Gray	
9 September		Robert Gray	
13 September		. .	Rec'd. Box of Silurian Brachiopods
17 September		Robert Gray	
16 October		. . .	Ret'd. Mr Gray's box to Mr Young
21 October		Mr Young	writes he paid 3/- carriage for box
No letters recorded from the Grays after November 1865 and during 1866			
1 December	1866	Mr Young	but no reference to Grays
23 August	1867	Mr Young	
28 August		Mr Young	
29 August		. . .	Ret'd. 4 Girvan brachs. from Hunterian
1 September		Mr Young	
18 September		Robert Gray	
7 October		Mrs Gray	*Triplesia*
15 October		Mr Young	
22 October		Mrs Gray	*'Triplesia'* & *Discina perrugata*
		Dr. Young	
1 November		Robert Gray	
4 November		. .	Rec'd box—'some good things'
8 November		Robert Gray	Sent fossil / Ret'd. same day
11 December		Mr Young	Selected material from Gray Coll'n
19 July	1868	Mrs Gray	Sends 3 species / Ret'd. same day
15 September		Mr Young	Ref. to Mr & Mrs Gray collecting
9 December	1869	Mrs Gray	Sent box of summer's collecting
15 February	1870	. . .	Ret'd. Mrs Gray's specimens
23 March		Mrs Gray	Rec'd. box back
23 November		Mrs Gray	Sent box of summer's collection; Keep good specmns. of *Stroph. Grayi*
13 December		Mrs Gray	*Lept. Grayi*
13 June	1871	Mrs Gray	Rec'd. box back
27 June	Davidson visited Robert Gray @ St. Vincent Str Branch, City of Glasgow Bank.		
Nothing further during 1871, 1872, 1873			
22 April	1874	. . . .	Ret'd. box of Ayrshire Brachiopods
8 November		Mrs Gray	
1 September	1875	Mrs Gray	Sends *Siphonotreta* & *'Lingula'*
7 September		.	Rec'd. *Siphonotreta* & *'Lingula'*
23 January	1876		Ret'd. *Siphonotreta* & *Lingula*
24 August		Mr Etheridge	Mrs Gray has some more Girvan fossils
16 October		Mr Young	Brit. Assoc. *Western Scottish Fossils*
20 October		Mr Young	? draw Mrs Gray's *Lingula*
30 October		Mrs Gray	Sends 5 *Siphonotreta*
2 November		Mrs Gray	Sends 4 *Lingula*
26 November		Mr Young	

DATE		FROM	DAVIDSON'S NOTE
17 January	1877	Mrs Gray	? re her specimens
22 January		. . . . .	Ret'd. Mrs Gray's specimens
29 January		Mrs Gray	Rec'd specimens; asks for paper ?
23 February		Davidson send copies of paper	
5 April		Mrs Gray	Asks Davidson to determine brachs.
25 July	1878	Davidson visited Mrs Gray @ 13, Inverleith Road	
29 August		Mrs Gray	Sent 4 Brachiopods
23 September		. . . . .	Ret'd 4 specimens to Mrs Gray
12 September	1879	Mrs Gray	Asks Davidson to determine specimens from Doularg Barr; reports successful collecting season.
10 October		Mrs Gray	Sent fossils from Doularg
5 November		. . . . .	Ret'd all specimens to Mrs Gray
9 November		Mrs Gray	Rec'd. all specimens safely
4 June	1881	Mr Young	Mrs Gray has gone to Ayrshire
7 November		Mrs Gray	*Triplesia grayi*; Nicholson's grant
19 November		Mrs Gray	*Atrypa incerta*; Girvan brachs.
		. . . . .	Davidson Rec'd. box safe.
22 November		Mr R. Etheridge	Mrs Gray has given him her *Lingula* & *Discina* specimens
28 November		. . . . .	Davidson ret'd. *Triplesia* specimens.
29 November		Mr R. Etheridge	Will forward Mrs Gray's specimens to Davidson
2 December		Mrs Gray	Rec'd. specimens safely
6 February	1882	Mrs Gray	
11 February		Mrs Gray	Sent box of *Rhynchonella*
		Davidson commenced his examination of Gray coll'n.	
20 February		. . . . .	Rec'd. box from Mrs Gray; 'very fine series'
24 February		C. Lapworth	re Girvan succession & Mrs Gray's coll'n.
27 February		C. Lapworth	
2 March		Mrs Gray	Send material horizon by horizon
13 March		Mrs Gray	Sent parcel Whitehouse Bay fossils
14 March		Mr Young	
15 March		C. Lapworth	
20 March		Mrs Gray	Rec'd. box safe; preparing next
1 April		. . . . .	Ret'd 3rd lot of Girvan fossils
8 April		Mrs Gray	Rec'd. 3rd lot safe; prep'n of 5th
12 April		. . . . .	Ret'd. 4th lot of Girvan fossils
15 April		. . . . .	Rec'd 5th lot; 'large & very fine series'
17 April		Mrs Gray	Rec'd. [4th] lot safe; two more to send
27 April		Mrs Gray	Sent 6th lot; large No of specimens
8 May		Mrs Gray	Prep'n of 7th lot; Penkill material
17 May			Note
22 May		Davidson entry: 'I finished . Mrs Gray's collection'	
24 May		. . . . .	Ret'd. 7th lot of Girvan Brachiopoda
25 May		C Lapworth	Rec'd 'magnificient table'
26 May		Mrs Gray	Rec'd list
14 June		Mrs Gray	
15 June		C. Lapworth	
30 June		Mrs Gray	Sends *M cymbula*
10 July		. . . . .	Ret'd. *Merista cymbula*
13 July		Mrs Gray	Sends 3 *Leptaena*
18 July		Mrs Gray	Rec'd. 3 *Leptaena* back
10 August (Girvan)		Mrs Gray	
10 September		Mrs Gray	Removed to Bank of Scotland House
28 September		. .	Davidson sends Pl. proofs

DATE		FROM	DAVIDSON'S NOTE
21 October		Mrs Gray	Sends parcel of summer's specimens
26 October		Mrs Gray	Sends box of this year's fossils
28 October		Mr Young	
3 November		Mrs Gray	Promises Ayrshire locality information
6 November		Mrs Gray	Preparing locality list
13 November		C. Lapworth	
14 November		Mrs Gray	Locality list + Lapworth's comments
15 November		Mrs Gray	re mistake in list
25 November		Mrs Gray	Rec'd. box of fossils safely back
25 March	1883	Mrs Gray	Appr'n. for his work on her coll'n ; Nicholson & Etheridge have given up; she needs someone for rest, especially Mollusca.
Nothing further until:			
3 September (Girvan)		Mrs Gray	Apologies for not sending duplicates
28 November		Mrs Gray	Promise of a series of Duplicates
25 January	1884	Mrs Gray	Sends box with a few duplicates promise of more after Autumn visit
26 January		.....	Rec'd. a small selection of Girvan Sil. fossils

Apparently nothing further for there are no other entries re Mrs Gray in the remaining volumes of Davidson's letterbooks.

APPENDIX 2

Mrs Gray Correspondence in Palaeontology Library Archives, British Museum (Natural History)

Summary of contents

LETTERS FROM	Vol. 1	Vol. 2
Mrs Elizabeth Gray	86	90
F. A. Bather	65	41
Smith-Woodward	–	12
Charles Lapworth	3	4
Robert Etheridge	2	–
Prof. T. Rupert Jones	2	–
J. R. Gregory	2	2
F. R. C. Reed	1	–
Thomas Davidson	1	–
J. Barrande	1	–
J. F. Blake	1	–
J. Horne	1	–
Dr Perner	1	–
Charles Schuchert	1	4
W. K. Spencer	1	1
W. S. Boulton	–	2
G. F. Herbert Smith	–	1
Frank H. Mel earn	–	1
Darcy W. Thompson	–	1
J. H. Withers	–	1

LETTERS TO	Vol. 1	Vol. 2
Mrs Elizabeth Gray	81	65
F. A. Bather	79	52
Dr. Smith-Woodward	3	39
Charles Lapworth	2	2
Henry Woodward	1	–
Prof. Fritsch	1	–
Dr Schondorf	1	–
F. R. C. Reed	1	–
Dr Wheelton Hind	–	1

LETTERS FROM	Vol. 1	Vol. 2	LETTERS TO	Vol. 1	Vol. 2
F. A. BATHER TO:			MRS ELIZABETH GRAY TO:		
Mrs Gray	63	38	Dr F. A. Bather	79	51
Smith-Woodward	–	2	Smith-Woodward	3	36
			Charles Lapworth	2	2
Fritsch	1	–	Henry Woodward	1	–
Schöndorf	1	–	F. R. C. Reed	1	–
			Wheelton Hind	–	1
	65	40		86	90

Mrs Elizabeth Gray Correspondence Vol. 1, 1874–1914

	DATE	WRITER	TO
No. 1		Mrs Gray	Dr Charles Lapworth
No. 2	24 November 1874	R. Etheridge	Rbt. Gray
No. 3	23 May 1876	J. Barrande	Mrs Gray
No. 4	18 January 1877	T. Davidson	Mrs Gray
No. 5	24 August 1878	J. F. Blake	Mrs Gray
No. 6	8 January 1881	R. Etheridge	Mrs Gray
No.GL/H*	6 December 1884	Mrs Gray	[Dr Henry Woodward]
No. 7	26 August 1885	T. Rupert Jones	Mrs Gray
No. 8	3 October 1892	F. A. Bather	Mrs Gray
No. 9	5 October 1892	Mrs Gray	Dr F. A. Bather
No.10	18 October 1892	Mrs Gray	Dr F. A. Bather
No.11	20 October 1892	F. A. Bather	Mrs Gray
No.12	26 October 1892	Mrs Gray	Dr F. A. Bather
No.13	29 October 1892	F. A. Bather	Mrs Gray
No.14	5 June 1893	T. Rupert Jones	Mrs Gray
No.15	20 August 1894	Mrs Gray	Dr Bather
No.16	21 August 1894	F. A. Bather	Mrs Gray
No.17	27 August 1894	F. A. Bather	Mrs Gray
No.18	11 October 1895	T. Rupert Jones	Mrs Gray
No.19	17 February 1896	Mrs Gray	Dr Bather
No.20	18 February 1896	F. A. Bather	Mrs Gray
No.21	20 November 1898	Mrs Gray	Charles Lapworth
No.22	29 November 1898	Charles Lapworth	Mrs Gray
No.23	? date *c.* 1938	Alice Gray	Dr Bather
No.24	11 June 1899	Mrs Gray	Dr Bather
No.25	16 January 1899	F. A. Bather	Mrs Gray
No.26	28 June 1899	Mrs Gray	Dr Bather
No.27	29 June 1899	F. A. Bather	Mrs Gray
No.28	19 December 1899	J. W. Gregory	Mrs Gray
No.29	22 December 1899	J. W. Gregory	Mrs Gray
No.30	9 March 1900	F. A. Bather	Mrs Gray
No.31	12 March 1900	Mrs Gray	Dr Bather
No.32	14 March 1900	F. A. Bather	Mrs Gray
No.33	30 July 1900	Mrs Gray	Dr Bather
No.34	31 July 1900	F. A. Bather	Mrs Gray
No.35	19 January 1901	Mrs Gray	Dr Bather
No.36	22 January 1901	F. A. Bather	Mrs Gray
No.39	2 July 1901	F. A. Bather	Mrs Gray
No.37	19 June 1902	Mrs Gray	Dr Bather
No.38	26 June 1902	Mrs Gray	Dr Bather

	Date	Writer	To
No.40	5 July 1903	Mrs Gray	Dr Bather
No.41	18 August 1903	Mrs Gray	Dr Bather
No.42	19 August 1903	F. A. Bather	Mrs Gray
No.43	2 September 1903	F. A. Bather	Mrs Gray
No.44	3 September 1903	Mrs Gray	Dr Bather
No 45	10 April 1904	Mrs Gray	Dr Bather
No 46	11 April 1904	F. A. Bather	Mrs Gray
No.47	14 April 1904	Mrs Gray	Dr Bather
No.48	16 April 1904	F. A. Bather	Mrs Gray
No.49	25 June 1906	Mrs Gray	Dr Bather
No.50	26 June 1906	F. A. Bather	Mrs Gray
No.51	4 July 1906	Mrs Gray	Dr Bather
No.52	24 July 1907	Mrs Gray	Dr Bather
No.53	26 July 1907	F. A Bather	Mrs Gray
No.54		F. A. Bather	Prof Dr. Anton Fritsch
No.55	27 August 1907	Mrs Gray	Dr Bather
No.56	2 October 1907	Mrs Gray	Dr Bather
No.57	4 October 1907	F. A Bather	Mrs Gray
No 58	31 October 1907	Mrs Gray	Dr Bather
No.59	1 November 1907	F. A. Bather	Mrs Gray
No.60	4 November 1907	Mrs Gray	Dr Bather
No 61	6 November 1907	F. A. Bather	Mrs Gray
No 62	7 November 1907	Mrs Gray	Dr Bather
No 63	2 December 1907	Mrs Gray	Dr Bather
No.64	3 December 1907	F. A Bather	Mrs Gray
No.65	9 January 1908	J Horne	Mrs Gray
No.66	4 May 1908	Mrs Gray	Dr Bather
No.67	6 May 1908	F. A Bather	Mrs Gray
No 68	29 November 1908	Mrs Gray	Dr Bather
No 69	1 December 1908	F. A. Bather	Mrs Gray
No.70	5 December 1908	Mrs Gray	Dr Bather
No.71	? December 1908	F. A Bather	Dr. F. Schondort
No.72	23 February 1909	F. R. C. Reed	Mrs Gray
No 73	8 December 1909	Mrs Gray	Dr Bather
No.74	15 December 1909	F. A. Bather	Mrs Gray
No.75	20 December 1909	Mrs Gray	Dr Bather
No.83	8 July 1910	Dr Perner	Mrs Gray
No 76	23 November 1910	Mrs Gray	Dr Bather
No.77	25 November 1910	F. A Bather	Mrs Gray
No 78	1 December 1910	Mrs Gray	Dr Bather
No.79	17 December 1910	Miss Mary Gray	Mr Bather
No 80	17 December 1910	F. A Bather	Miss M Gray
No 81	29 December 1910	Mrs Gray	Dr Bather
No.82	2 January 1911	F. A Bather	Mrs Gray
No 84	5 January 1911	Mrs Gray	Dr Bather
No 85	21 January 1911	Mrs Gray	Dr Bather
No.86	23 January 1911	F. A Bather	Mrs Gray
No 87	28 January 1911	Mrs Gray	Dr Bather
No.88	5 February 1911	Mrs Gray	Dr Bather
No 89	6 February 1911	F. A Bather	Mrs Gray
No 90	6 February 1911	F A Bather	Mrs Gray
No 91	7 February 1911	Mrs Gray	Dr Bather
No.92	10 February 1911	Mrs Gray	Dr Bather
No 93	13 February 1911	F. A Bather	Mrs Gray
No 94	14 February 1911	Mrs Gray	Dr Bather

	Date	Writer	To
No.95	15 February 1911	F. A. Bather	Mrs Gray
No.96	19 February 1911	Mrs Gray	Dr Bather
No.97	20 February 1911	Mrs Gray	Dr Bather
No 98	23 February 1911	F. A. Bather	Mrs Gray
No.99	25 February 1911	Mrs Gray	Dr Bather
No.100	February 1911	Mrs Gray	Mr Reed
No.101	7 March 1911	Mrs Gray	Dr Bather
No.102	7 March 1911	Mrs Gray	Dr Bather
No.103	7 March 1911	Mrs Gray	Dr Bather
No.104	9 March 1911	F. A. Bather	Mrs Gray
No.105	31 March 1911	Charles Schuchert	Mrs Gray
No.106	8 April 1911	F. A. Bather	Mrs Gray
No.107	13 April 1911	Mrs Gray	Dr Bather
No.108	17 April 1911	F. A. Bather	Mrs Gray
No.109	29 April 1911	Mrs Gray	Dr Bather
No.110	15 May 1911	W. K. Spencer	Mrs Gray
No.111	30 October 1911	Mrs Gray	Dr Bather
No.112	30 October 1911	Mrs Gray	Dr Bather
No.113	31 October 1911	F. A. Bather	Mrs Gray
No.114	7 November 1911	F. A. Bather	Mrs Gray
No.115	8 November 1911	Mrs Gray	Dr Bather
No.115a	9 November 1911	F. A. Bather	Mrs Gray
No.116	18 May 1912	Mrs Gray	Dr Bather
No.117	27 May 1912	F. A. Bather	Mrs Gray
No.118	29 May 1912	Mrs Gray	Dr Bather
No.119	31 May 1912	F. A. Bather	Mrs Gray
No.120	14 June 1912	F. A. Bather	Mrs Gray
No.121	17 June 1912	Mrs Gray	Dr Bather
No.122	9 November 1912	Mrs Gray	Dr Bather
No.123	11 November 1912	F. A. Bather	Mrs Gray
No.124	16 November 1912	Mrs Gray	Dr Bather
No.125	19 November 1912	F. A. Bather	Mrs Gray
No.126	28 November 1912	Mrs Gray	Dr Bather
No.127	6 December 1912	F. A. Bather	Mrs Gray
No.128	6 December 1912	Mrs Gray	Dr Bather
No.129	14 January 1913	F. A. Bather	Mrs Gray
No.130	19 January 1913	Mrs Gray	Dr Bather
No.131	21 January 1913	F. A. Bather	Mrs Gray
No.132	23 January 1913	Mrs Gray	Dr Bather
No.133	24 January 1913	F. A. Bather	Mrs Gray
No.134	30 January 1913	Mrs Gray	Dr Bather
No.135	1 February 1913	F. A. Bather	Mrs Gray
No.136	12 February 1913	F. A. Bather	Mrs Gray
No.137	19 February 1913	F. A. Bather	Mrs Gray
No 138	18 March 1913	Mrs Gray	Dr Bather
No.139	19 March 1913	F. A. Bather	Mrs Gray
No.140	27 March 1913	Mrs Gray	Dr Bather
No.141	27 August 1913	Mrs Gray	Dr Bather
No.142	29 August 1913	F. A. Bather	Mrs Gray
No.143	3 December 1913	Mrs Gray	Dr Bather
No.144	4 December 1913	F. A. Bather	Mrs Gray
No.145	12 February 1914	Mrs Gray	Dr Bather
No.146	14 February 1914	F. A. Bather	Mrs Gray
No.148	16 February 1914	Mrs Gray	Dr Bather
No.147	3 March 1914	Mrs Gray	Dr Bather

	Date	Writer	To
No.149	4 March 1914	F. A. Bather	Mrs Gray
No.150	12 March 1914	Mrs Gray	Dr Bather
No.151	13 March 1914	F. A. Bather	Mrs Gray
No.152	17 March 1914	Mrs Gray	Dr Bather
No.153	19 March 1914	F. A. Bather	Mrs Gray
No.154	12 April 1914	Charles Lapworth	Mrs Gray
No.155	20 May 1914	Mrs Gray	Dr Smith Woodward
No.156	10 June 1914	Charles Lapworth	Mrs Gray
No.157	12 June 1914	Mrs Gray	Dr Smith Woodward
No.158	27 July 1914	Mrs Gray	Dr Bather
No.159	29 July 1914	Mrs Gray	Dr Smith Woodward
No.160	9 October 1914	Mrs Gray	Dr Bather
No.161	10 October 1914	F. A. Bather	Mrs Gray
No.162	13 October 1914	Mrs Gray	Dr Bather
No.163	15 October 1914	F. A. Bather	Mrs Gray
No.164	19 October 1914	Mrs Gray	Dr Bather
No.165	14 December 1914	Mrs Gray	Dr Bather
No.166	18 December 1914	F. A. Bather	Mrs Gray
No.167	20 December 1914	Mrs Gray	Dr Bather

* GL/H = GENERAL LIBRARY Handwriting collection

Mrs Elizabeth Gray Correspondence Vol. 2, 1915–1923

	Date	Writer	To
No. 1	12 January 1915	F. A. Bather	Mrs Gray
No. 2	12 January 1915	F. A. Bather	Mrs Gray
No. 3	14 January 1915	Mrs Elizabeth Gray	Dr Bather
No. 4	21 January 1915	Mrs Elizabeth Gray	Dr Smith Woodward
No. 5	30 June 1915	Mrs Elizabeth Gray	Dr Bather
No. 6	4 February 1915	F. A. Bather	Mrs Gray
No. 7	5 February 1915	Mrs Elizabeth Gray	Dr Smith Woodward
No. 8	9 February 1915	Mrs Elizabeth Gray	Dr Bather
No. 9	28 July 1915	Mrs Elizabeth Gray	Dr Bather
No.10	30 July 1915	F. A. Bather	Mrs Gray
No.11	2 August 1915	Mrs Elizabeth Gray	Dr Bather
No.12	5 August 1915	F. A. Bather	Mrs Gray
No 13	11 August 1915	Mrs Elizabeth Gray	Dr Bather
No.14	21 August 1915	F. A. Bather	Mrs Gray
No.15	16 October 1915	F. A. Bather	Mrs Gray
No.16	20 October 1915	Mrs Elizabeth Gray	Dr Bather
No.17	21 October 1915	F. A. Bather	Mrs Gray
No.18	25 October 1915	Mrs Elizabeth Gray	Dr Bather
No.19	26 October 1915	F. A. Bather	Mrs Gray
No 20	6 November 1915	F. A. Bather	Mrs Gray
No 21	8 November 1915	Mrs Elizabeth Gray	Dr Bather
No.22	9 November 1915	Mrs Elizabeth Gray	Dr Bather
No 23	10 November 1915	F. A. Bather	Mrs Gray
No.24	13 November 1915	Mrs Elizabeth Gray	Dr Bather
No 25	16 November 1915	Mrs Elizabeth Gray	Dr Bather
No 26	17 November 1915	T. H. Withers	Mrs Gray
No.27	28 November 1915	Charles Schuchert	Mrs Robert Gray
No 28	13 December 1915	Mrs Elizabeth Gray	Dr Bather
No 29	13 January 1916	Charles Schuchert	Mrs Elizabeth Gray

	Date	Writer	To
No.30	20 January 1916	Mrs Elizabeth Gray	Dr Bather
No.31	22 January 1916	F. A. Bather	Mrs Gray
No.32	31 January 1916	Mrs Elizabeth Gray	Dr Bather
No.33	4 February 1916	F. A. Bather	Mrs Gray
No.34	6 February 1916	Mrs Elizabeth Gray	Dr Bather
No.35	10 February 1916	F. A. Bather	Mrs Gray
No.36	14 February 1916	Mrs E. Gray	Dr Bather
No.37	21 June 1916	Charles Schuchert	Mrs Gray
No.38	6 December 1916	Mrs Elizabeth Gray	Dr Bather
No.39	7 December 1916	F. A. Bather	Mrs Gray
No.40	10 December 1916	Mrs Elizabeth Gray	Dr Bather
No.41	31 January 1917	Frank H. McLearn	Mrs Elizabeth Gray
No.42	9 February 1917	Mrs Elizabeth Gray	Dr Lapworth
No.43	12 February 1917	Chas. Lapworth	Mrs Gray
No.44	16 April 1917	Charles Schuchert	Mrs Gray
No.45	20 November 1917	Chas. Lapworth	Mrs Gray
No.46	7 January 1918	Mrs Elizabeth Gray	Dr Bather
No.47	11 December 1917	W. K. Spencer	Mrs Gray
No.48	10 January 1918	F. A. Bather	Mrs Gray
No.49	24 January 1918	Mrs Elizabeth Gray	Dr Bather
No.50	25 October 1918	Mrs Elizabeth Gray	Dr Bather
No.51	26 October 1918	F. A. Bather	Mrs Gray
No.52	16 December 1918	Mrs Elizabeth Gray	Dr Bather
No.52a	21 December 1918	F. A. Bather	Mrs Gray
No.53	21 December 1918	Mrs Elizabeth Gray	Dr Woodward
No.54	1 January 1919	A. Smith Woodward	Mrs Gray
No.55	9 January 1919	Mrs Elizabeth Gray	Dr Woodward
No.56	13 January 1919	A. Smith Woodward	Mrs Gray
No.57	22 January 1919	Mrs Elizabeth Gray	Dr Woodward
No.58	10 February 1919	F. A. Bather	Mrs Robert Gray
No.59	4 March 1919	Mrs Elizabeth Gray	Dr Bather
No.60	19 June 1919	Mrs Elizabeth Gray	Dr Bather
No.61	22 June 1919	F. A. Bather	Mrs Gray
No.62	24 September 1919	Chas. Lapworth	Mrs Gray
No.63	20 September 1919	Mrs Elizabeth Gray	Dr Lapworth
No.64	5 November 1919	Charles Lapworth	Mrs Gray
No.65	13 January 1920	Mrs Elizabeth Gray	Dr Bather
No.66	16 January 1920	F. A. Bather	Mrs Gray
No.67	9 February 1920	F. A. Bather	Mrs Gray
No.68	10 February 1920	Mrs Elizabeth Gray	Dr Woodward
No.69	14 February 1920	A. Smith Woodward	Mrs Gray
No.70	12 February 1920	Mrs Elizabeth Gray	Dr Bather
No.71	21 February 1920	Mrs Elizabeth Gray	Dr Woodward
No.72	25 February 1920	Mrs Elizabeth Gray	Dr Woodward
No.73	26 February 1920	A. Smith Woodward	Mrs Gray
No.74	27 February 1920	F. A. Bather	Dr Woodward
No.75	2 March 1920	A. Smith Woodward	Mrs Gray
No.76	6 March 1920	Mrs Elizabeth Gray	Dr Woodward
No.77	8 March 1920	Mrs Elizabeth Gray	Dr Woodward
No.78	8 March 1920	A. Smith Woodward	Mrs Gray
No.79	10 March 1920	Mrs Elizabeth Gray	Dr Woodward
No.80	22 March 1920	Mrs Elizabeth Gray	Dr Woodward
No.81	24 March 1920	A. Smith Woodward	Mrs Gray
No.82	25 March 1920	Mrs Elizabeth Gray	Dr Woodward
No.83	29 March 1920	A. Smith Woodward	Mrs Gray

	Date	Writer	To
No.84	31 March 1920	Mrs Elizabeth Gray	Dr Woodward
No.85	5 April 1920	Mrs Elizabeth Gray	Dr Woodward
No.86	9 April 1920	F. A. Bather	Mrs Robert Gray
No.87	22 April 1920	Mrs Elizabeth Gray	Dr Woodward
No.88	22 April 1920	Mrs Elizabeth Gray	Dr Woodward
No.88a		Mrs E. Gray	Dr Woodward
No.88b		Mrs E. Gray	Dr Woodward
No.89	21 May 1920	Mrs Elizabeth Gray	Dr Bather
No.90	27 May 1920	Mrs E. Gray	Dr Bather
No.91	27 May 1920	Mrs Elizabeth Gray	Dr Woodward
No.92	3 June 1920	Mrs Elizabeth Gray	Dr Bather
No.93	15 June 1920	F. A. Bather	Dr Woodward
No.94	16 June 1920	Mrs Elizabeth Gray	Dr Hind
No.95	23 June 1920	F. A. Bather	Mrs Gray
No.96	23 June 1920	Mrs Elizabeth Gray	Dr Bather
No.97	23 June 1920	Mrs Elizabeth Gray	Dr Woodward
No.98	29 June 1920	A. Smith Woodward	Mrs Gray
No.99	6 July 1920	Mrs Elizabeth Gray	Dr Bather
No.100	8 July 1920	Mrs Elizabeth Gray	Dr Woodward
No.101	12 July 1920	Mrs E. Gray	Dr Bather
No.102	15 July 1920	Mrs Elizabeth Gray	Dr Woodward
No.103	20 July 1920	Mrs Elizabeth Gray	Dr Bather
No.104	2 August 1920	Mrs Elizabeth Gray	Dr Bather
No.105	3 September 1920	Mrs E. Gray	Dr Bather
No.105a	8 September 1920	Mrs E. Gray	Dr Bather
No.105b	13 September 1920	Mrs E. Gray	Dr Bather
No.106	21 October 1920	Mrs Elizabeth Gray	Dr Bather
No.107	25 October 1920	F. A. Bather	Mrs Gray
No.108	3 November 1920	Mrs E. Gray	Dr Bather
No.109	4 November 1920	F. A. Bather	Mrs Gray
No.110	29 November 1920	A. Smith Woodward	Mrs Gray
No.111	1 December 1920	Mrs Elizabeth Gray	Dr Woodward
No.112	4 January 1921	Mrs Elizabeth Gray	Dr Woodward
No.113	31 January 1921	Mrs Elizabeth Gray	Dr Woodward
No.114	3 February 1921	G. F. Herbert Smith	Dr A. S. Woodward
No.115	23 February 1921	Darcy W. Thompson	Mrs Gray
No.116	8 March 1921	Mrs Elizabeth Gray	Dr Woodward
No.117	9 March 1921	Mrs Elizabeth Gray	Dr Bather
No.118	10 March 1921	F. A. Bather	Mrs R. Gray
No.119	10 March 1921	Mrs Elizabeth Gray	Dr Woodward
No.120	14 March 1921	Mrs Elizabeth Gray	Dr Bather
No.121	14 March 1921	Mrs Elizabeth Gray	Dr Woodward
No.122	1 June 1921	Mrs Elizabeth Gray	Dr Woodward
No.123	6 June 1921	Mrs Elizabeth Gray	Dr Woodward
No.124	8 July 1921	Mrs Elizabeth Gray	Dr Woodward
No.125	3 September 1921	F. A. Bather	Mrs Gray
No 126	21 September 1921	F. A. Bather	Mrs Gray
No 127	23 September 1921	Mrs Elizabeth Gray	Dr Bather
No 128	8 October 1921	Mrs Elizabeth Gray	Dr Bather
No 129	12 October 1921	W. S. Boulton	Mrs Gray
No.130	17 October 1921	Mrs Elizabeth Gray	Dr Woodward
No 131	18 October 1921	A. Smith Woodward	Mrs Gray
No 132	25 October 1921	Mrs Elizabeth Gray	Dr Woodward
No 133	26 October 1921	A. Smith Woodward	Mrs Gray
No.134	8 November 1921	W. S. Boulton	Mrs 'Bray'

	Date	Writer	To
No.135	21 February 1922	J. W. Gregory	Dr Bather
No.136	9 March 1922	Mrs Elizabeth Gray	Dr Woodward
No.137	10 March 1922	F. A. Bather	Mrs Gray
No.138	13 March 1922	Mrs Elizabeth Gray	Dr Bather
No.139	1 March 1922	J. W. Gregory	Mrs Gray
No.140	24 March 1922	Mrs Elizabeth Gray	Dr Woodward
No.141	17 June 1922	Mrs Elizabeth Gray	Dr Bather
No.142	17 June 1922	F. A. Bather	Mrs Gray
No.143	19 December 1922	Mrs Elizabeth Gray	Dr Bather
No.144	27 December 1922	Mrs Elizabeth Gray	Dr Bather
No.145	23 January 1923	F. A. Bather	Mrs Gray
No.146	23 January 1923	F. A. Bather	Mrs Gray
No.147		F. A. Bather	List of Fossils
No.148	26 January 1923	Mrs Elizabeth Gray	Dr Bather
No.149	29 January 1923	F. A. Bather	Mrs Gray
No.150	22 November 1923	Mrs Elizabeth Gray	Dr Bather
No.151	23 November 1923	F. A. Bather	Mrs Gray
No.152	12 December 1923	Mrs Elizabeth Gray	Dr Bather
No.153	14 December 1923	F. A. Bather	Mrs Gray
No.154	21 December 1923	F. A. Bather	Mrs Gray
No.155	28 December 1923	F. A. Bather	Mrs Gray

APPENDIX 3

List of Alice Gray letters in General File, British Museum (Natural History)

	Date	Writer	To
No. 1	1 March 1924	A. S. Alexander	Miss Alice Gray
No. 2	3 March 1934	Alice Gray	T. H. Withers
No. 3	[7 May 1934]	T. H. Withers	Miss Alice Gray
No. 4	14 May 1934	Alice Gray	Mr Withers
No. 5	24 January 1937	Alice Gray	Dr Lang
No. 6	26 January 1937	W. N. Edwards	Miss Alice Gray
No. 7	29 January 1937	W. D. Lang	Miss Alice Gray
No. 8	7 February 1937	Alice Gray	Dr Lang
No. 9	11 February 1937	W. D. Lang	Miss Alice Gray
No.10	2 April 1937	Alice Gray	Dr Lang
No.11	22 March 1937	Alice Gray	Dr Lang
No.12	23 March 1937	Alice Gray	Dr Lang
No.13	25 March 1937	W. D. Lang	Miss Alice Gray
No.14	28 March 1937	Alice Gray	Dr Lang
No.15	31 March 1937	Alice Gray	Dr Lang
No.16	22 April 1937	W. D. Lang	Miss Alice Gray
No.17	4 May 1937	Alice Gray	Dr Lang
No.18	6 May 1937	Alice Gray	Dr Lang
No.19	11 May 1937	W. N. Edwards	Miss Alice Gray
No.20	25 May 1937	Alice Gray	W. N. Edwards
No.21	29 May 1937	W. N. Edwards	Miss Gray
No.22	29 July 1937	Alice Gray	Dr Lang
No.23	30 July 1937	L. Bairstow	Miss Alice Gray
No.24	16 October 1937	Alice Gray	Mr Bairstow
No.25	19 October 1937	L. Bairstow	Miss Alice Gray

	Date	Writer	To
No 26	29 October 1937	Alice Gray	Mr Bairstow
No.27	29 October 1937	Alice Gray	Dr Lang
No.28	30 October 1937	L. Bairstow	Miss Alice Gray
No.29	5 December 1937	Alice Gray	Dr Lang
No 30	8 December 1937	W. D. Lang	Miss Alice Gray
No.31	10 December 1937	Dr H. H. Muir-Wood	Miss Alice Gray
No 32	12 December 1937	Alice Gray	Dr Muir-Wood
No.33	15 December 1937	Alice Gray	Dr Lang
No.34	17 December 1937	W. N. Edwards	Miss Alice Gray
No.35	13 January 1938	F. R. C. Reed	Miss Gray
No.36	1 February 1938	Alice Gray	Dr Lang
No.37	2 February 1938	F. R. C. Reed	Miss Gray
No.38	3 February 1938	W. D. Lang	Miss Alice Gray
No.39	8 February 1938	W. D. Lang	Miss Alice Gray
No.40	12 February 1938	W. D. Lang	Miss Alice Gray
No 41	14 February 1938	Alice Gray	Dr Lang
No.42	17 February 1938	W. N. Edwards	Miss Alice Gray
No.43	21 February 1938	Alice Gray	Dr Lang
No.44	23 February 1938	W. D. Lang	Miss Alice Gray
No.45	27 February 1938	Alice Gray	Dr Lang
No.46	1 March 1938	W. D. Lang	Miss Alice Gray
No.47	14 March 1938	L. F. Bairstow	Miss Gray
No.48	23 March 1938	L. Bairstow	Miss Alice Gray
No.49	31 March 1938	Alice Gray	Mr Bairstow
No.50	28 April 1938	Leslie Bairstow	Miss Alice Gray
No.51	5 May 1938	Alice Gray	Mr Bairstow
No.52	9 May 1938	Leslie Bairstow	Miss Alice Gray
No.53	24 May 1938	Alice Gray	Dr Lang
No.54	26 May 1938	W. D. Lang	Miss Gray
No.55	27 May 1938	Leslie Bairstow	Miss Alice Gray
No.56	13 August 1938	W. D. Lang	Miss Gray
No.57	16 August 1938	Alice Gray	Dr Lang
No.58	19 August 1938	Alice Gray	Dr Lang
No.59	27 August 1938	W. D. Lang	Miss Gray
No.60	17 September 1938	L. F. Bairstow	Miss Gray
No.61	7 October 1938	L. F. Bairstow	Miss Gray
No.62	31 October 1938	Alice Gray	Dr Lang
No.63	4 November 1938	Alice Gray	Miss Wood
No.64	8 November 1938	H. H. Muir-Wood	Miss Gray
No.65	11 November 1938	Alice Gray	Miss Muir-Wood
No.66	11 November 1938	Alice Gray	Leslie Bairstow
No.67	14 November 1938	W. N. Edwards	Miss Alice Gray
No.68	21 November 1938	Alice Gray	Mr Edwards
No.69	5 December 1938	Alice Gray	Mr Edwards
No 70	6 December 1938	W. N. Edwards	Miss Alice Gray
No.71	21 May 1940	Alice Gray	Mr Edwards
No 72	31 May 1940	W. N. Edwards	Miss Gray
No.73	2 June 1940	Alice Gray	W. N. Edwards
No.74	4 June 1940	W. N. Edwards	Miss Gray
No 75	19 August 1940	Alice Gray	W. N. Edwards
No 76	7 June 1941	W. N. Edwards	Miss Gray
No 77	15 June 1941	Alice Gray	W. N. Edwards
No 78	19 August 1941	W. N. Edwards	Miss [Alice] Gray
No 79	24 August 1941	Alice Gray	W. N. Edwards

Alice Gray—F. A. Bather Correspondence

	Date	Writer	To
No. 1	February 1924	Alice Gray	Dr Bather
No. 2	24 February 1924	Alice Gray	Dr Bather
No 3	27 February 1924	F. A. Bather	Miss Alice Gray
No. 4	18 March 1924	Alice Gray	Dr Bather
No. 5	19 March 1924	F. A. Bather	Miss Alice Gray
No. 6	22 February 1925	Alice Gray	Dr Bather
No. 7	23 February 1925	F. A. Bather	Miss Alice Gray
No. 8	29 January 1926	Alice Gray	Dr Bather
No. 9	31 August 1926	F. A. Bather	Miss Alice Gray
No.10	12 September 1926	Alice Gray	Dr Bather
No.11	14 September 1926	F. A Bather	Miss Alice Gray
No.12	14 July 1932	Alice Gray	Dr Bather
No.13	12 December 1932	Alice Gray	Dr Bather
No.14	13 December 1932	F. A. Bather	Miss Alice Gray
No.15	14 March 1933	L. Bairstow	Miss Alice Gray
No.16	19 March 1933	Alice Gray	L. Bairstow

Summary of all Alice Gray Correspondence [95 letters]

Letters from		Letters To	
Alice Gray	= 48	Alice Gray	= 47
F. A. Bather	= 6	F. A. Bather	= 8
Dr. W. D. Lang	= 13	Dr. W. D. Lang	= 21
W. N. Edwards	= 11	W. N Edwards	= 8
L. F. Bairstow	= 11	L. F. Bairstow	= 6
F. R. C. Reed	= 2		
T. H. Withers	= 1	T. H. Withers	= 2
H. H. Muir-Wood	= 2	H. H. Muir-Wood	= 3
A. Alexander	= 1		

APPENDIX 4

List of Gray Localities in the Girvan district

Locality			Ref. source	Zone	
Aldons, on the Stinchar River, about 5 miles S. of Girvan	Sheet LXII NW	L	N & E/27	Llandeilo	W'59
Ardmillan	Sheet LV SW & SE		Alice Gray		
['a small quarry by the side of the Old Mill Pond is sometimes taken for Ardmillan']					
Ardmillan Brae, about 2.5 miles SW of Girvan			N & E/14		
Ardmillan shore, 2.5 miles S. of Girvan	Sheet LV SW & SE	L	N & E/40	Llandeilo	W'59
Ardwell Shore, about 4 miles SW of Girvan			N & E/17		
Auchensoul, about 5 miles SE of Girvan	Sheet LVI SE		N & E/26		
AULDTHORNS			Mrs Gray		
Balcletchie, about 4 miles E of Girvan	Sheet LVI NE	L	N & E/21	Lwr. Ardwell	W'59
BALCLETCHIE CONGLOMERATE	Sheet LVI NE	L	Mrs Gray	Lwr. Ardwell	W'59
Bargany Pond, Head of burn passing B. Pond, about 6 miles E by N of Girvan			N & E/28		
'Bargany Pond Burn' see under Lauchlan Burn			See Note Sheet LVI NE		
Barbae, nearly 3 miles SE of Girvan			N & E/23		
BENAN CRAG			Mrs Gray		
BENAN BURN		L	Mrs Gray	Llandeilo	W'59
Blair Farm, Hillside opposite, about 8.5 miles NE of Girvan			N & E/29		
Bougang	Sheet LXVI NW		Alice Gray		
Braes, about 1.5 miles E of Girvan			N & E/34		
Camregan Plantation, about 2 miles E of Girvan		L	N & E/20	Upper Llandovery	
[= Camregan Wood]	Sheet LVI NW		Alice Gray		
= quarry on S side of Camregan Hill, *c.* 800 m SW of Penkill Castle			Howells/19	*M. sedgwicki*	
'Cliff Section'			Mrs Gray	Rawtheyan	Harper'82
[= small cliff above S. bank of Lady Burn, 40m downstream of Harper's C2 locality]					

Locality			Ref. source	Zone	
Colmonell, on the Stinchar Rd., about 7 miles S of Girvan			N & E/33		
Craigens, nr. Kirk Hill, about 5.5 miles NE of Girvan			N & E/13		
CRAIGENS [? = 'Red Quarry' of Salter, 1851: 171]	Sheet L NE				
N side of road below Craigens Hill, 250m from Howells/5			Howells/6	*C. vesiculosus*	
'old quarry close to March dyke separating Craigens Hill from Mulloch Hill'			Alice Gray		
Craighead Quarry, about 3 miles NE of Girvan	Sheet L SW	L	N & E/12	Upper Ardwell	W'59
Cuddystone Glen, about 1 mile S of Girvan	Sheet LVI NW	L	N & E/36	Upper Llandovery	
Davidson's Farm—see under Drummuck Harper 1982: 7					
DOULARG		L	Mrs Gray	Llandeilo	W'59
DOW HILL		L	Mrs Gray	Lwr. Ardwell	W'59
Drummuck Burn, about 4 miles NE of Girvan	Sheet L NW	L	N & E/9	Ashgill	H'82/L1
Drummuck, North bank above Lady Burn, 350m NW of Drummuck Farm			Harper '82/L1	Rawtheyan	H'82/L1
High Mains, about 6 miles NE of Girvan			N & E/1		
HIGH ROAD Crinoid Bed			Mrs Gray		
(see under Mulloch Hill High Road Quarry)					
Alice Gray's note: 'because the Crinoid bed became exhausted'	Sheet L NE				
KIRK HILL = Mulloch Hill					
Kirk Hill, nr. High Mains			N & E/2		
Kirk Hill, roadside nr. Old Fort			N & E/6		
Kirk Hill, Quarry on roadside to East of above loc.			N & E/7		
Cutting below summit on N. side of road			Howells/1	*C. vesiculosus*	
Cutting below summit on N. side of road, 130m W of above			Howells/2	*C. vesiculosus*	
Quarry below summit on N side of road, 120m W of above			Howells/3	*C. vesiculosus*	
small excavation 150m w of above			Howells/4	*C. vesiculosus*	
Bluff on N side of road, 300m W of loc. 3			Howells/5	*C. vesiculosus*	
see under Craigens			Howells/6		
small excavations 120m SW of summit			Howells/7	*C. vesiculosus*	
see under Mulloch Hill Quarry			Howells/8		

Locality			Ref. source	Zone	
see under Ladywell Wood			Howells/9		
exposure in banks of small stream			Howells/10	*M. cyphus*	
Kittleburn, Quarrel Hill, nr. Auldthorn, about 6 miles NE of Girvan					
			N & E/8		
Knockgardner, Quarry on roadside nr. K., about 10 miles N of Girvan					
			N & E/30		
in field S of road 400m NE of Knockgardner Farm			Howells/24	? Wenlock	
Knockdolian Mountain, nr. Colmonell, Stinchar Rd. S of Girvan					
			N & E/35		
Knockgerran, about 4.5 miles E of Girvan			N & E/37		
Lady Burn, above Drummuck			N & E/10		
Lady Burn, opposite Threave			N & E/11		
Laggan Burn, SE of Girvan			N & E/16		
Lauchlan Burn [= 'Bargany Pond Burn' of Gray Map]					
exposures in sides of Lauchlan Burn 1000m SW of summit of Maxwellston Hill					
			Howells/21	*M. sedgwicki*	
Letterpin, nearly 4 miles S. of Girvan			N & E/25		
Littleburn, SW of High Mains			N & E/3		
MINUNTION	Sheet LXII NW	L	Mrs Gray	Llandeilo	W/59
MYOCH BURN	Sheet LV SW & SE		Mrs Gray		
MULLOCH HILL now termed Kirk Hill (see Howells, 1972: 3)					
'This term used by Mrs Gray, encompasses all the localities					
immediately below Kirk Hill & those in Ladywell Wood.'					
locs. 1–9 are differentiated upon the basis of lithology and weathering					
Mulloch Hill, 4.5 miles NE of Girvan		L	N & E/31	Lwr. Llandovery	Howells
Mulloch Hill High Road Quarry	Sheet L NE		Alice Gray		
'. . . for many years [we] have called this quarry . . .' see also					
her footnote re Lamont's name					
[= Craigens Quarry of Lamont, 1935]			Howells/3	*C. vesiculosus*	
Mulloch Hill Quarry [Rough Neuk Quarry]	Sheet L NE		Alice Gray		
['Quarry in Ladywell Wood']					
Large disused quarry in Ladywell Wood			Howells/8	*M. cyphus*	
120m WSW of derelict Rough Neuk Cottage					

Locality			Ref. source	Zone	
Mulloch Hill in Wood	Sheet L NE		Alice Gray		
Overgrown outcrop in Ladywell Wood 140m SW of Rough Neuk Cottage			Howells/9	*M. cyphus*	
NEWLANDS			Mrs Gray	Middle Llandovery	H'72
small N–S sandstone ridge on E side of small stream 150m due E of Newlands Farm	Sheet L NE		Alice Gray Howells/14	*M. gregarius*	
Penkill, 3.5 miles NE of Girvan		L	N & E/32	Upper Llandovery	
PENKILL	Sheet LVI NW		Alice Gray		
['The rock showed on the E. bank of the Penkill Burn at this spot where the burn is little larger than a field drain. For many years the locality has been invisible because the grass and soil have covered over the fragment of rock that could once be seen:']					
Exposure in E bank of Penkill Burn 500m SE of Penkill Castle			Howells/22	*M. sedgwicki*	
NB lithology of Gray 'Penkill' material different (see Howells p. 4)					
Penwhapple Burn					
small exposure in E bank of Penwhapple Burn at confluence of small tributary			Howells/20	*M. segwicki*	
Penwhapple Glen, E of Girvan			N & E/18		
PENWHAPPLE GLEN	Sheet LVI NW		Alice Gray		
mistakenly marked (see Howells p. 4)					
exposure on E bank of Penwhapple Burn 350m W of Penkill Farm			Howells/23	*M. crispus*	
Penwhapple Waterfall	Sheet LVI NE		Alice Gray		
Piedmont Glen, S. of Girvan			N & E/15		
Pinmacher, about 2.5 miles S. of Girvan			N & E/24		
PINMORE			Mrs Gray		
Rough Neuk Quarry			N & E/5		
Rough Neuk, Quarry @ SW pond, about 6 miles NE of Girvan			N & E/4		
Saugh Hill, about 1.5 miles E of Girvan			N & E/19		

Locality			Ref. source	Zone	
SHALLOCH FORGE		L	Mrs Gray	Lwr Llandovery	H'72
Shalloch Mill, sea-shore 1.5 miles S of Girvan	Sheet I V SW & SE		N & E/38		
Shalloch Mill burn S of Mill			N & E/39		
STARFISH BED, temporary excavations, 650m ENE of South Threave Farmhouse (see discussion pp 219)	Sheet I. NW		Mrs Gray *et al* Alice Gray	Rawtheyan	Harper '82
THRAIVE		L	Mrs Gray	Ashgillian	Harper '82
THRAIVE GLEN	Sheet I NE		Mrs Gray		
small cliff above S. bank of Lady Burn, 100m S. of South Threave Farmhouse			Harper 1982/I.17	Rawtheyan	Harper '82
'Threave Glen'	Sheet I. NW		Alice Gray		
Tramitchell, about 3 miles SE of Girvan [= Tormitchell]		L	N & E/22	Llandeilo	W'59
WHITEHOUSE BAY	Sheet I.V SW & SE	L	Mrs Gray	Ashgill	
WOODLAND POINT	Sheet I.V SW & SE	L	Mrs Gray	Lwr Llandovery	H'72
Section only exposed at low-tide, 430m W of Woodland farm			Howells/18	*M. cyphus*	

L = locality mentioned by Lapworth
N & E = locality listed by Nicholson & Etheridge (1878–80); the numbers are those given in their list p. 7
Mrs Gray = Localities listed by Mrs Gray in the list she provided for Peach & Horne (1899) pp. 686–697
Alice Gray = Localities marked by Alice Gray on set of Maps *c.*1937
W'59 = Prof A. Williams (1959)
Howells and H'72 = localities listed by Y. Howells (1972)
H'82 = D. T. Harper (1982)

CONTENTS

Bulletin British Museum (Natural History)
HISTORICAL SERIES
Vol 17, No 2, November 1989

Historical Series

VOLUME 18 NUMBER 1 31 MAY 1990

The *Bulletin of the British Museum of Natural History*, instituted in 1949, is issued in four scientific series, Botany, Entomology, Geology (incorporating Mineralogy) and Zoology, and an Historical Series.

The Historical Series is edited in the Museum's Department of Library Services
Head of Department: Mr R. E. R. Banks
Editor: Miss P. Gilbert

Papers in the *Bulletin* are primarily the results of research carried out on the unique and ever-growing collections of the Museum, both by the scientific staff and by specialists from elsewhere who make use of the Museum's resources. Many of the papers are works of reference that will remain indispensable for years to come.

A volume contains about 256 pages, made up of two numbers: published Spring and Autumn. Subscriptions may be placed for one or more of the series on an Annual basis. Individual numbers and back numbers can be purchased and a Bulletin catalogue, by series, is available. Orders and enquiries should be sent to:

Sales Department,
Natural History Museum Publications,
British Museum of Natural History,
Cromwell Road,
London SW7 5BD

Telephone: 01-938-9386
Telex: 929437 NH PUBS G
Fax: 01-938-8709

World List abbreviation: *Bull. Br. Mus. nat. Hist* (hist. Ser.)

ISBN 0 565 09013 5
ISSN 0068 2306

Historical Series
Vol 18, No. 1, pp 1–113

British Museum (Natural History)
Cromwell Road
London SW7 5BD

Issued 31 May 1990

Typeset by J&L Composition Ltd, Filey, North Yorkshire
Printed in England by Henry Ling Ltd, The Dorset Press, Dorchester, Dorset

Bull. Br. Mus. Nat. Hist (Hist. Ser.) 18(1) 1–23 Issued 31 May 1990

The nomenclature of crabs collected during the cruises of HMS Porcupine in 1869 and 1870, with notes on the Norman collection of invertebrata and its acquisition by the British Museum (Natural History)

A. L. RICE

Institute of Oceanographic Sciences Deacon Laboratory, Wormley, Godalming, Surrey, U.K.

CONTENTS

INTRODUCTION

In preparation for a report on the decapod crustaceans collected during recent I.O.S. investigations in the Porcupine Seabight to the southwest of Ireland, previous collections from the same region have been reviewed. The earliest of these was obtained during a series of oceanographic cruises to the west of the British Isles made in the paddle gun vessel H.M.S. *Porcupine* (Fig. 1) in the summer of 1869. These cruises were very significant in the development of deep sea biology since they included the collection of the deepest dredge samples obtained prior to the *Challenger* Expedition of 1872–76.

The 1869 cruises, along with the short cruise of H.M.S. *Lightning* the previous year and that of the *Porcupine* to the Mediterranean in 1870, were the subject of Charles Wyville Thomson's classic volume, *The Depths of the Sea*, published in 1873 shortly after the *Challenger* began her epic voyage. Thomson's book summarised the state of oceanographic knowledge at the time and reviewed the main results of the *Lightning* and *Porcupine* cruises. However, despite the uniqueness of the deep biological samples, large parts of the collections were never worked up adequately. In particular, with the

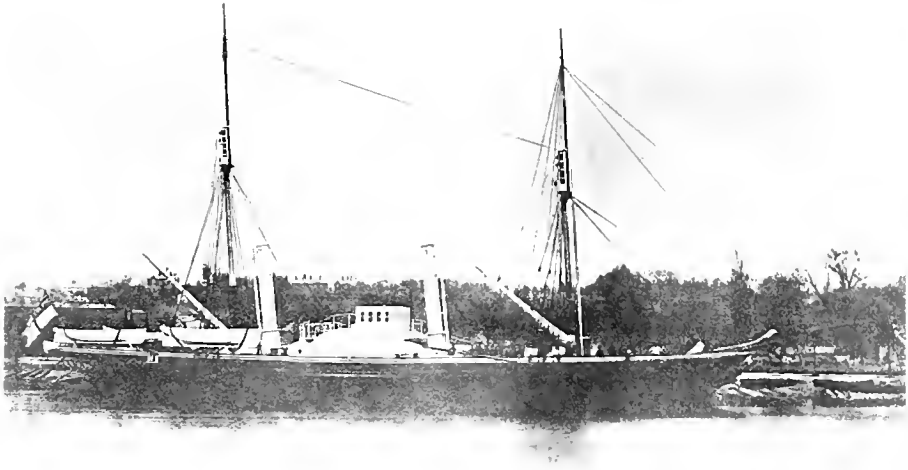


Fig. 1 HMS *Porcupine*. A wooden, two-masted paddle gun-vessel, built at Deptford Dockyard in 1844, the *Porcupine* was 141 feet long and had a displacement of 490 tons. This rather poor photograph, apparently the only one of the ship in existence, is reproduced by kind permission of the Hydrographer to the Navy.

parts of the collections were never worked up adequately. In particular, with the exception of the isopods, very few of the crustaceans were reported upon at all except in *The Depths of the Sea*. In the case of the decapods, Thomson mentioned three previously undescribed crab species, *Dorhynchus thomsoni* (as *Dorynchus*, see Holthuis, 1962), *Rochinia carpenteri* (as *Amathia*) and *Cymonomus granulatus* (as *Ethusa*). Thomson made it clear that he had been furnished with these names by A. M. Norman to whom the study of the crustaceans had been entrusted. Norman had recognised these species as new, but neither before the appearance of Thomson's book, nor subsequently, did he publish descriptions of them. The *Porcupine* collections also included a fourth undescribed crab species, *Ebalia nux*, which was not mentioned by Thomson and first appeared in print as a *nomen nudum* in a preliminary account of the voyage of the *Travailleur* (Norman, 1880) and was subsequently figured in Milne-Edwards (1883) and described in Pocock (1889). In the ensuing confusion the names have been variously attributed to Norman, Thomson, Norman in Thomson, Milne-Edwards, and Norman in Milne-Edwards (see Appendix 1). This paper attempts to explain how this confusion arose and to establish the correct authorship of the species concerned.

In dealing with these questions I have inevitably become embroiled with the 'Norman Collection', a large collection of crustaceans and many other invertebrate groups, which came to the British Museum (Natural History) around the turn of the century. The origins and history of this important collection do not seem to have been properly documented in the past; brief details, particularly of the chronology of its acquisition by the Museum, are therefore provided.

THE PORCUPINE CRUISES

Following the success of the short cruise of the *Lightning* in 1868, the larger and more suitable *Porcupine* made three separate cruises during the summer of 1869, the first under the scientific direction of J. G. Jeffreys, the second under C. W. Thomson and the third apparently under the joint leadership of Thomson and W. B. Carpenter (see Thomson, 1873; Deacon, 1971; Rice, 1986).

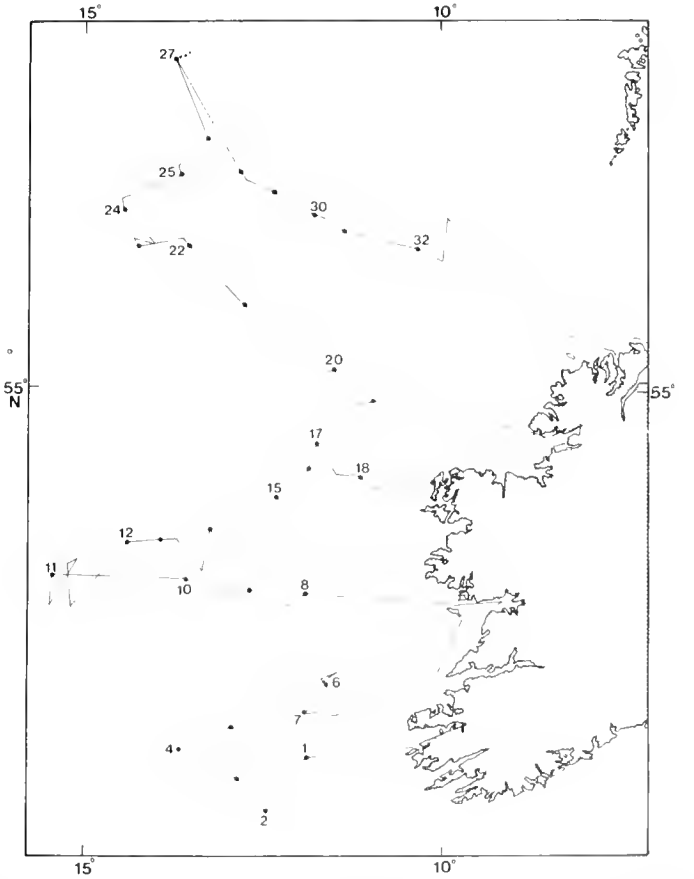


Fig. 2 Track of the first cruise of HMS *Porcupine* in 1869, with the station positions marked. Redrawn from Thomson, 1873, plate II.

The first cruise (Fig. 2) lasted from 18 May to 13 July during which the *Porcupine* worked along three loops to the west and north of Ireland; one across the northern part of the Porcupine Seabight and back to Galway, a second running west from Galway across the Porcupine Bank into the Rockall Trough and back to Killibegs, and a third

across the northern part of the Rockall Trough to the Rockall Bank and back to Lough Swilly, after which the ship docked in Belfast. A total of 32 official dredging stations were worked, down to 808 fathoms (1480m) on the first 'loop', to 1230 fathoms (2250m) on the second, and to 1476 fathoms (2700m) on the third. An additional even deeper dredge haul (station 11, 1630 fathoms) was apparently not successful since although Thomson (1873, p. 142) included it in a table of dredging stations, neither he nor Jeffreys (1869) mention it in their respective narratives. A number of dredge hauls, mostly in rather shallow water but including the first haul of the cruise at a depth of 110 fathoms (200m) some 40 miles off Valentia, were not given station numbers.

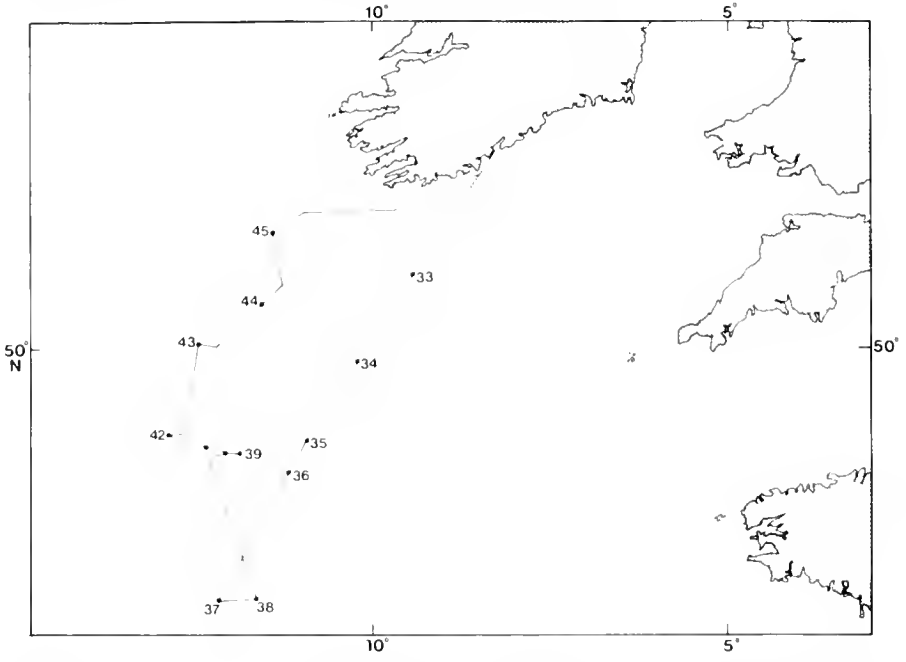


Fig. 3 Track of the second cruise of HMS *Porcupine* in 1869. Redrawn from Thomson, 1873, plate III.

Following the arrival of the *Porcupine* in Belfast, Thomson took over the scientific direction from Jeffreys and the ship sailed once more on 17 July for the second cruise (Fig. 3). The original intention had been to continue the work of the first cruise to the east and north of Rockall to join up with the work in the Faeroe–Shetland Channel accomplished from the *Lightning* the previous year. However, since dredging had already been accomplished successfully down to almost 1500 fathoms, with abundant animal life having been found at this depth, a new plan was adopted. Instead of proceeding to the northern area where only relatively modest soundings were known to occur, Thomson successfully applied to the Hydrographer, G. H. Richards, for permission to work to the south-west of Ireland where, some 250 miles west of Ushant, a sounding of 2500 fathoms was shown on the chart. Since there were few reliable soundings deeper than about 3000 fathoms anywhere in the ocean, Thomson reasoned that if they could demonstrate the existence of life down to 2500 fathoms '. . . the general question would be virtually solved for all depths of the ocean, and any further

investigation of its deeper abysses would be mere matter of curiosity and of detail' (Thomson, 1873, p. 93).

After calling at Queenstown to coal and to pick up Carpenter's son, P. H. Carpenter, the *Porcupine* sailed once more on 19 July and proceeded in a roughly south-westerly direction, dredging at relatively shallow depths as she crossed the Great Sole Bank and the unsuspected very rough topography of the upper parts of King Arthur Canyon to the south of the Goban Spur. Finally, on 22 and 23 July two successful dredge hauls were obtained on the abyssal plain south of the Pendragon Escarpment at 2435 and 2090 fathoms respectively (stations 37 and 38), depths which were not to be exeeeded until February 1874 as H.M.S. *Challenger* sailed from the Canaries towards the Antilles.

The *Porcupine* now steamed northwards once more, towards the southwestern tip of Ireland, taking a series of four dredge samples on the Goban spur (Stations 39–42) and three (43–45) on the eastern flank of the Porcupine Seabight. After coaling at Haulbowline on 2 August the vessel reached Belfast on Wednesday 4. On August 7 Thomson summarised the results of the cruise in a letter to A. M. Norman (see Mills, 1980) which was presented at the annual meeting of the British Association in Exeter and published in the Annual Report (Rep. Brit. Ass. 1869 (1870): 115). That Norman should work on the crustaceans collected was already decided, for Thomson ends his letter 'I trust to your contributing the Crustacea, which will be sent to you as soon as possible.'

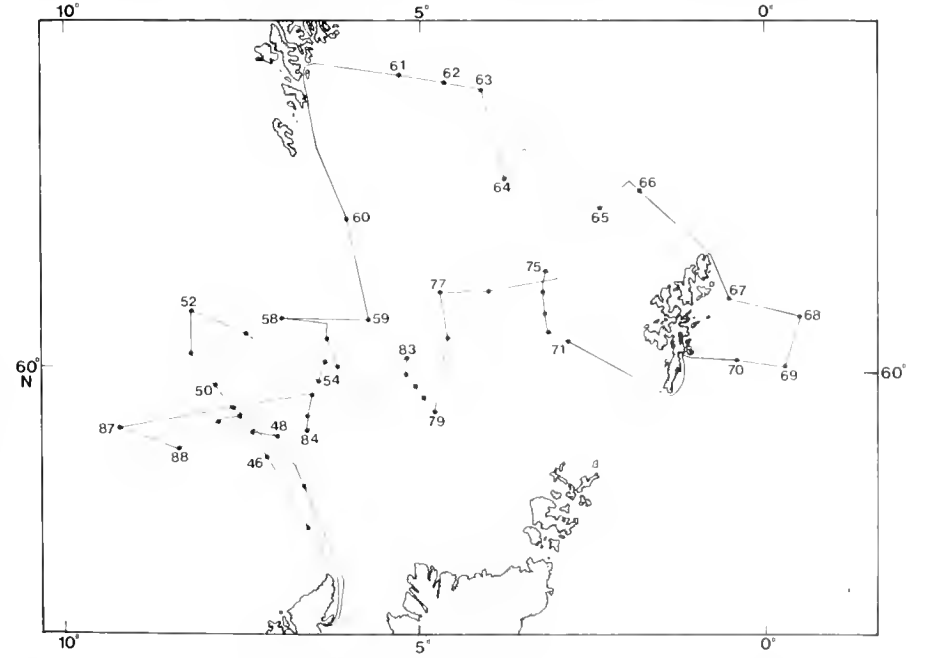


Fig. 4 Track of the third cruise of HMS *Porcupine* in 1869. Redrawn from Thomson, 1873, plate IV.

Having been joined by W. B. Carpenter, and having had her boilers cleaned out, the *Porcupine* sailed from Belfast on August 11, making for Stornoway from where she was to begin the third and final cruise of 1869 to extend the work of the *Lightning* the previous year (Fig. 4). The ship left Stornoway on August 15 and returned three weeks

Fig. 5 The Rev. Canon Alfred Merle Norman, 1831–1918. Both from undated portrait photographs: (left) published in *Proceedings of The Royal Society of London* 1919 (Obituary Notices) B 90: xlvi–l (see Stebbing, 1919); (right) from portrait collection of Library Services BM (NH).

later, having called at Thorshaven and Lerwick and having worked 41 dredgingstations between the Faeroes and Shetland and four to the east of Shetland. Finally, on September 15 the *Porcupine* returned to Belfast where the scientists left her.

Following the success of the 1869 cruises the *Porcupine* was made available once more in 1870, this time for work in the Mediterranean. As before, the total time available was to be divided into separate cruises, the first part, from Falmouth to Gibraltar, to be under the scientific direction of Jeffreys, and the Mediterranean cruise to be overseen by Carpenter and Thomson. In the event Thomson was taken ill and did not participate in the 1870 cruises.

The ship left Falmouth on July 4 and, after experiencing fog and contrary winds in the western Channel, eventually reached the continental slope to the south of the Great Sole Bank three days later. Between 7 and 11 July a series of nine dredge hauls were taken in the region between 48°06′ and 48°38′N and 9°11′ and 10°15′W. This region is now known to be highly dissected by canyons where a modern oceanographer would be very reluctant to shoot a dredge or trawl for fear of losing the gear. In the relative ignorance provided by traditional rope soundings the *Porcupine* seamen and scientists cheerfully fished their gear repeatedly in the area at depths ranging between 93 and 717 fathoms (170m and 1312m), apparently retrieving the dredge safely on each occasion and only twice obtaining an unsatisfactory catch!

Jeffreys was now anxious to obtain some dredge hauls in the neighbourhood of the very deep stations sampled the previous year. Unfortunately, however, the ship encountered bad weather and had to make for Vigo, all of the remaining *Porcupine* samples being from off the Iberian Peninsula and within the Mediterranean. Before reaching Gibraltar Jeffreys worked a further 30 'official' dredge stations together with a number in shallow waters which were not given station numbers. At Gibraltar he handed over to Carpenter who took a total of 23 hauls in the western Mediterranean before returning to Cowes on October 8.

THE FATE OF THE DECAPODS

In accordance with the intention expressed in Thomson's letter mentioned above, the vast majority of the *Lightning* and *Porcupine* crustaceans were sent to the Rev. A. M. Norman (Fig. 5), then serving as Rector of the coal-mining parish of Burnmoor in the dioceses of Durham (Stebbing, 1919; Mills, 1980). Most of this material remained in Norman's care for at least 28 years, eventually reaching the British Museum (Natural History) in the 'Norman Collection' between 1898 and 1911.[1]

By the time Thomson was preparing *The Depths of the Sea*, Norman had obviously carried out at least a preliminary examination of most of the decapod material collected and had apparently begun to prepare some descriptive texts which were made available

[1] Perhaps not surprisingly, Norman, and probably the other specialists to whom the samples were sent, did not receive all of the material collected. P. Herbert Carpenter, for instance, presented five *Dorhynchus thomsoni*, four *Munida tenuimana*, and one *Rochinia carpenteri* to the Museum in 1882 (registered under 82.14). These specimens are labelled as collected from the *Porcupine* in the 'North Atlantic, warm area', and must therefore have been taken during the third cruise in 1869 in which Carpenter participated. He presumably took them for his own collection as souvenirs of the cruise and it is very likely that other material similarly found its way into private collections. Some of the material that followed the more official routes similarly failed to find its way into the national collections, the classic example being the molluscs which went to Jeffreys and were ultimately purchased by the Smithsonian Institution along with the rest of Jeffreys' collection (Waren, 1980).

to Thomson. On the basis of the information provided to him, Thomson recorded the discovery of the following three new crab species.[2]

Dorhynchus thomsoni Thomson, 1873

Thomson's treatment of this species consisted of the following short passage (p. 175). 'A pretty little stalk-eyed form *Dorynchus thomsoni*, Norman (Fig. 34), small and delicate, and very distinct from all previously described species of the genus, is very widely distributed. This crab, from its long spiny legs and light body, very often comes up entangled on the part of the rope which had been passing over the ground.'

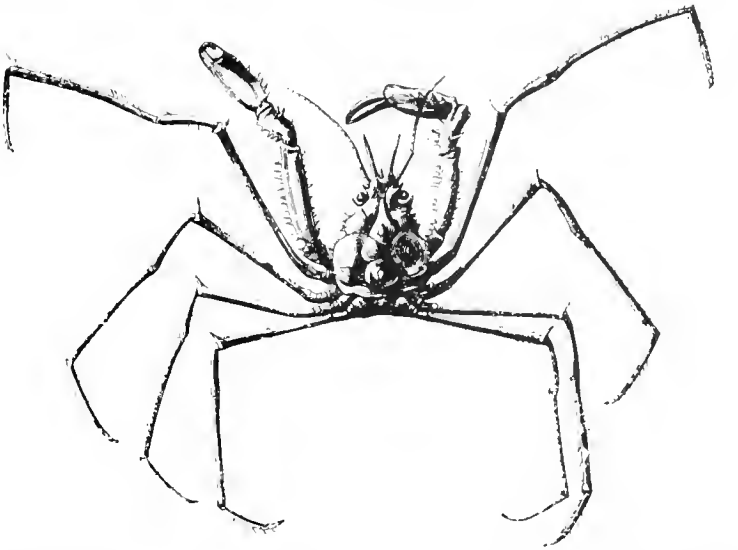


Fig. 6 Thomson's original, and rather poor, illustration of *Dorhynchus thomsoni*. (From *The Depths of the Sea*, fig. 34, p. 174).

This is a rather curious statement since this was the first mention of the genus *Dorynchus* (later corrected to *Dorhynchus* (see Holthuis, 1962), so that there were no 'previously described species of the genus'. This almost certainly indicates that Norman had initially intended to place the new species in an existing genus, probably *Inachus*, but decided to establish the new genus after Thomson had already incorporated the original concept. Alone, the text would certainly not establish the identify of the species beyond doubt, but the illustration (Fig. 6), while not good, is certainly identifiable and can be associated with the specimen (B.M.(N.H.) reg. no. 1907.8.28.5) on which the figure is based. Following Thomson, the authorship of this species was consistently attributed to Norman for almost a century until its correct attribution, to Thomson, was established by Holthuis (1962) and the illustrated specimen was designated as the lectotype in Christiansen (1969). The species is thus one of the few examples of a specific epithet which is legitimately based on the same name as that of its author.

[2] From the preliminary account of the 1870 *Porcupine* cruise by Carpenter and Jeffreys (1870) it is clear that Norman originally intended to give quite different names to two of these species; *Ethusa granulata* was to have been *E. mirabilis*, while *Amathia Carpenteri* was to have been *A. Jeffreysi*. However, since neither of these original names were accompanied by descriptions they are both *nomina nuda*

Rochinia carpenteri (Thomson, 1873)

Following on from the *Dorhynchus* passage, Thomson wrote (p. 176) 'Another handsome new species, *Amathia carpenteri*, Norman (Fig. 35), was common in the sandy chalk-mud of the "*Holtenia* ground". The genus had previously been familiar as a Mediterranean form.' As in the case of *Dorhynchus*, this statement would clearly not identify the species but, as before, the illustration (Fig. 7), which in this case is good, is readily identifiable and can again be linked with the specimen on which it was based (B.M.(N.H.) reg. no. 1907.8.28.3). Again as in *D. thomsoni*, the authorship of this species was consistently attributed to Norman until its correct attribution was established by Sivertsen and Holthuis (1956) and the illustrated specimen was selected as the lectotype by Christiansen (1969).

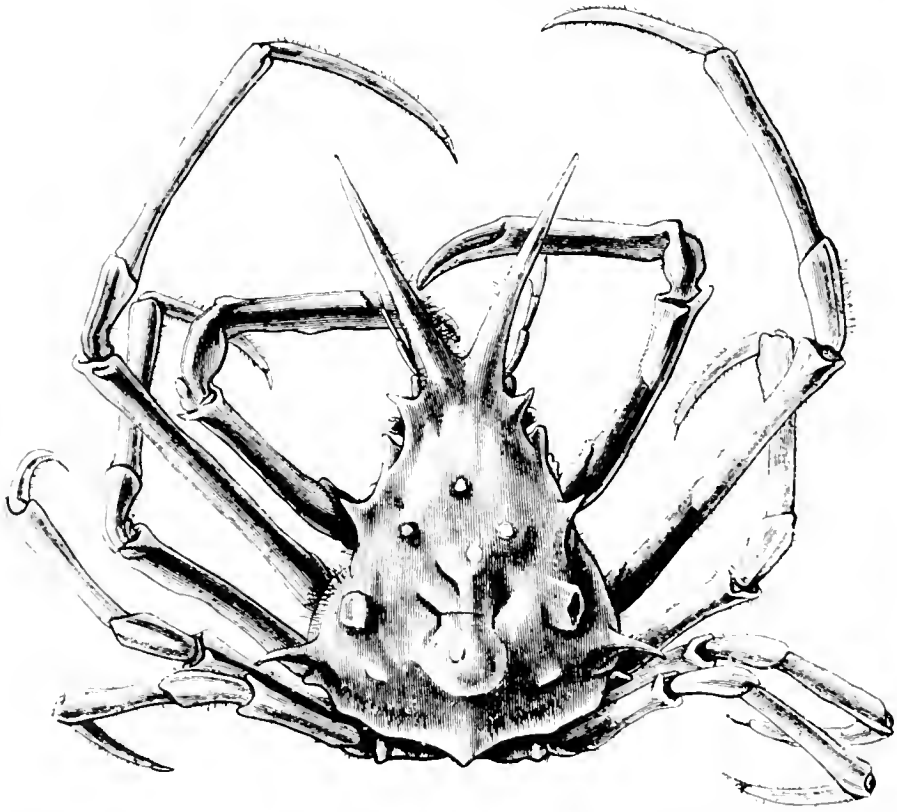


Fig. 7 Thomson's original illustration of *Rochinia carpenteri* (From *The Depths of the Sea*, fig. 35, p. 175).

Cymonomus granulatus (Norman in Thomson, 1873)

The third new crab species is more problematical. Thomson did not illustrate this species and mentions it in the following passage following directly on from the reference to *Rochinia carpenteri*.

> 'I quote from a preliminary notice of the Crustacea by the Rev. A. Merle Norman: "*Ethusa granulata* (sp. n.), the same species as that found off Valentia, but exhibiting

> a most extraordinary modification of structure. The examples taken at 110–370 fathoms in the more southern habitat have the carapace furnished in front with a spinose rostrum of considerable length. The animal is apparently blind, but has two remarkable spiny eye-stalks, with a smooth rounded termination where the eye itself is ordinarily situated. In the specimens however from the north, which live in 542 and 705 fathoms, the eye-stalks are no longer moveable. They have become firmly fixed in their sockets, and their character is quite changed. They are of much larger size, approach nearer to each other at their base, and instead of being rounded at their apices they terminate in a strong rostrate point. No longer used as eyes, they now assume the functions of a rostrum; while the true rostrum so conspicuous in the southern specimens has, marvellous to state, become absorbed. Had there been only a single example of this form procured, we should at once have concluded that we had found a monstrosity, but there is no room for such an hypothesis by which to escape from this most strange instance of modification of structure under altered conditions of life. Three specimens were procured on two different occasions, and they were in all respects similar."'

Thirty years later Lankester (1903) maintained that two distinct species had been confused in this statement. Accordingly, he proposed the retention of Norman's specific name for the apparently shallow-living form, and named the more modified form *normani* in Norman's honour. In the meantime, *E. granulata* had been transferred to the genus *Cymonomus*, established by Alphonse Milne-Edwards (1880) for *C. quadratus*, a species collected from the *Blake* in the West Indies. The transfer was first reported by Milne-Edwards (1881) in a preliminary account of the results of the *Travailleur* expedition of 1881 in which *C. granulatus* was recorded from the Mediterranean, though it was neither described nor illustrated. Norman (1880) had himself already reported the species from the *Travailleur* collections made off the north coast of Spain in 1880, a cruise in which both he and John Gwyn Jeffreys had been invited to participate. At the same time Norman noted that the species had also been taken off Portugal during the 1870 cruise of the *Porcupine*, along with *Dorynchus Thomsoni*, *Amathia Carpenteri* and *Ebalia nux*.

Up to this time no illustration of a *Cymonomus* species had been published, but in 1883 a *Travailleur* specimen of *Cymonomus granulatus* appeared on a plate in Milne-Edwards' privately printed *Recueil de figures des Crustacés nouveaux ou peu connus* (see Fig. 8). Parts of this plate were reproduced or redrawn for Filhol's (1885) semi-popular account of the *Travailleur* and *Talisman* cruises, and later in Milne-Edwards and Bouvier's (1900) detailed account of the decapods collected during these expeditions. At the same time, *C. granulatus* was reported from as far south as 21°53′N, off the coast of north-west Africa.

At this point there had been no suggestion that two species might be involved, but Lankester's interest was aroused by a reference to Norman's account in Lubbock's book *The Beauties of Nature* (1893), in which *Ethusa granulata* is cited as an example of a species with a wide bathymetric range in which there is a progressive modification and reduction in the eyes with increasing depth. Initially, Lankester thought that the species might form the basis of an instructive public exhibit in the British Museum (Natural History) of which he had been director since 1898. But as he investigated this possibility he concluded that two distinct taxa were involved and he also uncovered what he thought were a series of errors which had led to considerable confusion in the interpretation of Norman's original notes.

First, it was clear that Lubbock had wrongly attributed Norman with referring to three forms, including one 'living near the surface' in which well-developed eyes are present; in fact, Norman referred to only two.

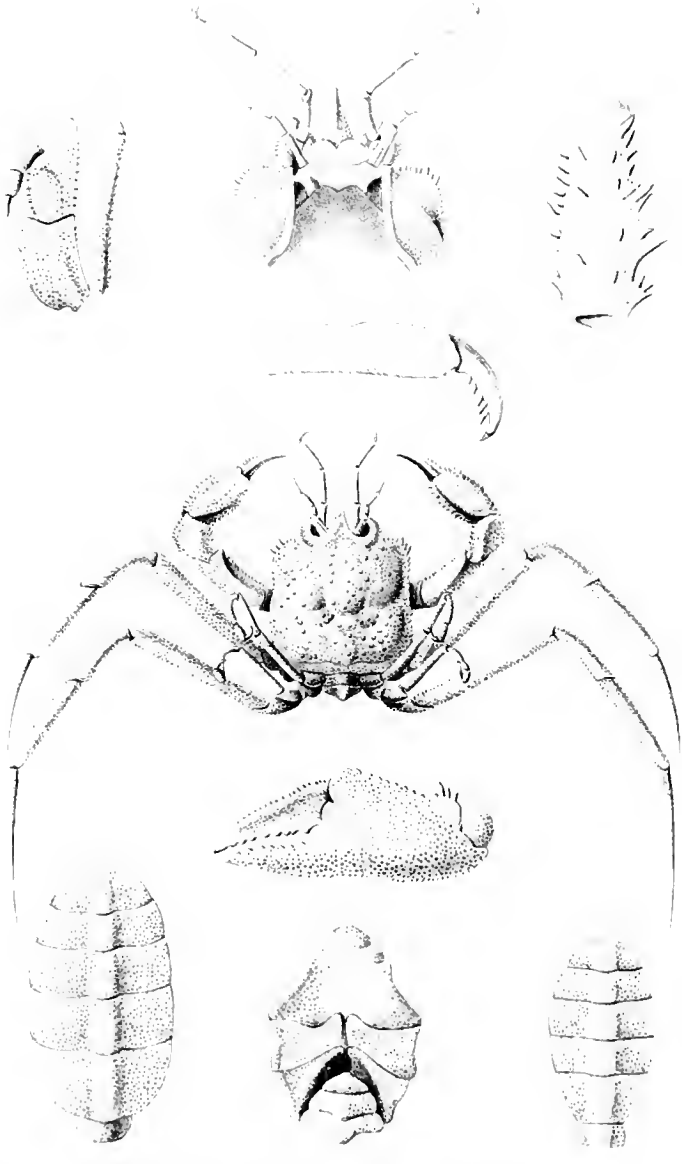


Fig. 8 The plate illustrating *Cymonomus granulatus* in Milne-Edwards (1883), *Recueil de figures des Crustacés nouveaux ou peu connus*.

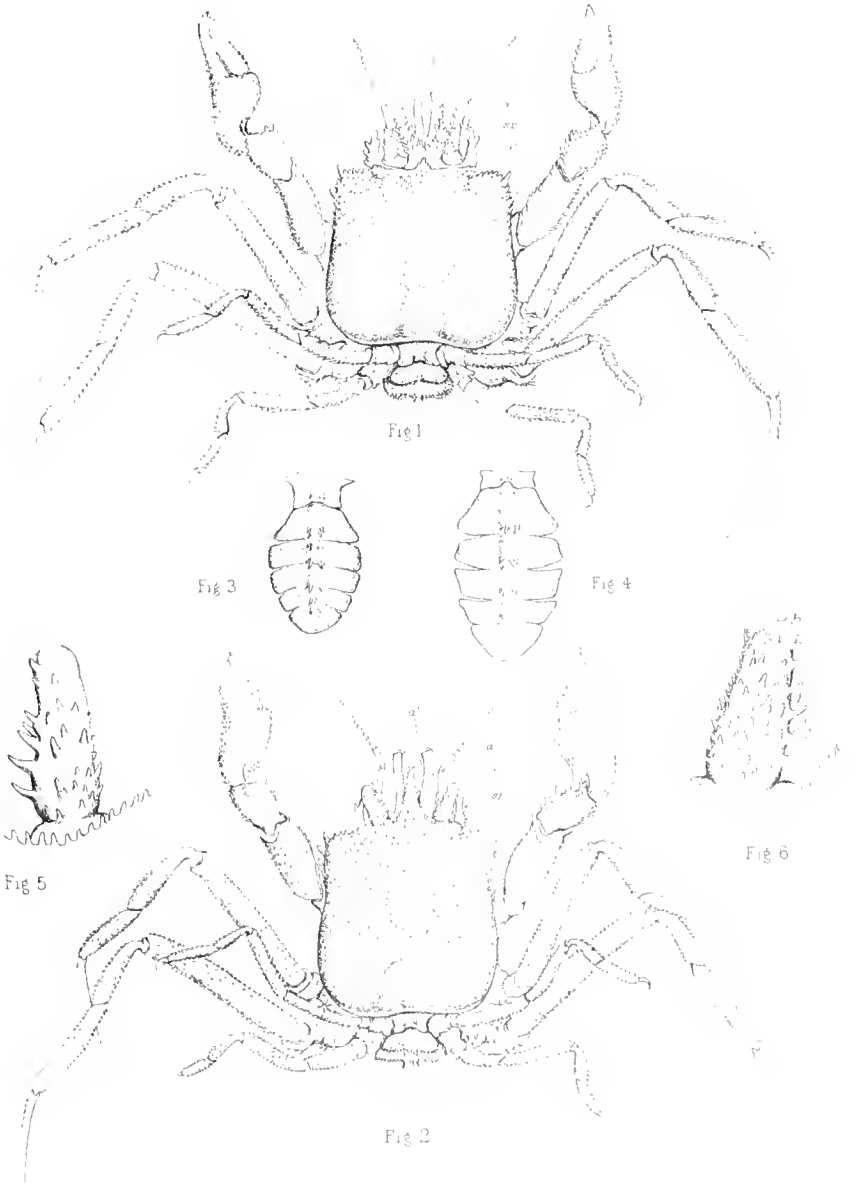


Fig. 9 Illustrations of *Cymonomus normani* (Fig. 1) and *Cymonomus granulatus* (Figs. 2–6) by Albany Hancock which appeared in Lankester (1903)

Second, Lankester pointed out that Norman's quoted passage was somewhat misleading. Norman had intimated that the two forms were bathymetrically separated, the 'modified' form being the deeper-living. But Lankester demonstrated that the specimens which Norman had available to him from the *Porcupine* cruises of 1869 came from overlapping depth ranges, the normal form having been taken at stations in depths ranging from 106 to 808 fathoms (193–1471m), while the three specimens of the modified form were from 542 and 705 fathoms (986–1283m). Instead, Lankester thought that the two forms were geographically separated. All of the known examples of the 'modified' form at the time of Lankester's study were from northern localities, the three specimens collected from the *Porcupine* being from the '*Holtenia* ground' at about 59°30′N, while a single specimen had been taken by the *Ingolf* south west of Iceland at a depth of 486 fathoms (885m) and was dealt with later in Hansen (1908). The 'normal' form, on the other hand, had been encountered only at much more southerly localities, from south-west of Ireland to off north-west Africa and the Mediterranean. Furthermore, Norman's quoted text had included the statement that the eyes in the modified form 'terminate in a strong rostrate point. No longer used as eyes, they now assume the functions of a rostrum.' This, wrote Lankester, had naturally led to the assumption that 'their terminations become combined into a strong pointed beak'.

Third, Lankester claimed that the specimen illustrated in Milne-Edwards' '*Recueil . . .*', and later in the *Travailleur* and *Talisman* report, had had the eyes removed before being given to the artist. While these illustrations are not very clear, and are certainly very inferior to the excellent ones by Hancock reproduced in Lankester's paper (Fig. 9), I believe that Lankester was mistaken and that the eyes are included. In any case, this point is relatively unimportant to the general problem of the nomenclature and authorship of the two *Cymonomus* species since Milne-Edwards' illustrations clearly show the normal form with a well-developed rostrum.[3].

Having thus carefully examined the published data and the available material, Lankester provided an excellent comparison of the species concerned, including *C. quadratus*, clearly describing his new species *C. normani*. This description was based on the three *Porcupine* specimens taken at stations 47 and 88 though Lankester did not designate a holotype.

However, Lankester introduced an element of confusion himself, for in two places (pp. 444 and 455) he refers to a description of *granulatus* supposedly published by Norman in the Annual Report of the British Association for 1873. Even if such a paper had been published it would have been pre-dated by *The Depths of the Sea* which was published earlier the same year. In fact, however, the paper does not appear to have been published, even by title only as was not unusual at that time. The quotation from Thomson's book, reproduced above, must therefore be considered the first published description associated with the name *Ethusa granulata*. This passage clearly associates Norman's name with the form taken off Valentia, with a well-developed rostrum and well-separated eyes with smooth corneal regions. Since this unequivocally identifies the species concerned, and is equally unequivocally in the words of Norman rather than Thomson (see Article 50, p. 91 in the *International Code of Zoological Nomenclature*, Third Edition, 1985) its correct attribution should be *Cymonomus granulatus* (Norman in Thomson, 1873).

[3] Similarly irrelevant, though nevertheless remarkable, was the erroneous depiction of chelate fourth and fifth pereiopods, pointed out by Lankester, in the first published illustration of *Cymonomus quadratus* which appeared in Milne-Edwards and Bouvier (1902)

Ebalia nux Milne-Edwards, 1883

This fourth crab species in the Porcupine collection which Norman recognised as previously undescribed was not mentioned in *The Depths of the Sea*. The first published indication that the species had been taken from the *Porcupine* was in Norman's (1880) *Travailleur* report where 'Ebalia nux, Norman' was mentioned in a list but was not accompanied by a description. The species similarly appeared as a *nomen nudum* in Milne-Edwards (1881) and in Marion (1883). In 1883 a *Travailleur* specimen was illustrated in Milne-Edwards' '*Recueil* ...' and was labelled *Ebalia nux* (Norm.) (Fig. 10).

The first written description was provided by Pocock (1889) in an account of the crustaceans collected off the coast of Ireland in the *Flying Fox* (= ?*Flying Falcon*, see Rice, 1986) in July 1889. Pocock had joined the staff of the British Museum (Natural History) in 1885 and had succeeded E. J. Miers in charge of the Crustacea Section, being himself succeeded by W. T. Calman in 1903. During his period at the Museum, Pocock worked mainly on the arachnids and myriapods, writing very few papers on the crustaceans. He was therefore not part of the rather close-knit marine biological establishment of the time, nor of the international carcinological community, whereas Norman was a central figure in both groups. This almost certainly contributed to the acrimonious series of published exchanges between the two men which followed the publication of the *Flying Fox* report.

In dealing with *Ebalia nux*, Pocock was unaware of any previous descriptions but had before him material of the species collected from the *Porcupine* in the Mediterranean in 1870 and already deposited at the B.M.(N.H.) by Norman. He accordingly referred to the species as '*Ebalia nux*, Norman, MS', described it and designated as types 'an adult male and female specimen belonging to the series dredged in the Mediterranean.'

Only a week or two after the *Flying Fox* cruise, the hydrographic survey vessel HMS *Research*, with G. C. Bourne aboard, had obtained a series of trawl samples in the same general area. When Bourne (1890) reported the results of this cruise he enlisted Norman's assistance and quoted some of the notes provided. These included a list of *Porcupine* and *Travailleur* localities at which *E. nux* had been obtained and the remarks that 'Mr. Pocock seems to have been unaware that *Ebalia nux* had been admirably figured by Prof. A. Milne Edwards', and that Profs A. Milne Edwards and Marion courteously recognised my MS. name *Ebalia nux*, but if that is rejected it will stand as *Ebalia nux*, A. Milne Edwards' and not, by implication, *Ebalia nux* Pocock.

Pocock (1890a) saw this as a charge of 'lack of courtesy for not giving what he [Norman] considers due acnowledgement to the name he applied to the above Crustacean' (somewhat provocatively referred to in the title of Pocock's note as '*Ebalia nux*, Milne-Edwards.') He went on to claim that in an effort to locate the original description of *Ebalia nux* he had written to Norman but received no reply, thus turning the charge of discourtesy back onto Norman, but carefully avoiding saying so.

Norman's (1890) response was swift and severe. After reproducing both Pocock's original reference to *E. nux* and his own notes quoted by Bourne, he suggests that Pocock had over-reacted to the latter due to his own guilty conscience. He goes on to admonish him as 'an Assistant at the British Museum, who has a magnificent library at his elbow', for failing to refer to Milne-Edwards' (1883) illustration of the species in the '*Recueil* ...' 'If he did not consult that work [wrote Norman], he ought to have done so. If he did consult it ... he had no excuse for writing '*Ebalia nux*, n. sp.' instead of either '*Ebalia nux*, Norman, MS., or '*Ebalia nux*, A. Milne-Edwards.'' Now Norman takes exception to Pocock's designation as the type material specimens collected from the *Porcupine* which had been sent to the Museum when E. J. Miers had been writing up the *Challenger* brachyurans. 'Whether this was a courteous act [wrote Norman] let others judge'. Finally, Norman deals with the problem of Pocock's letter rather lamely,

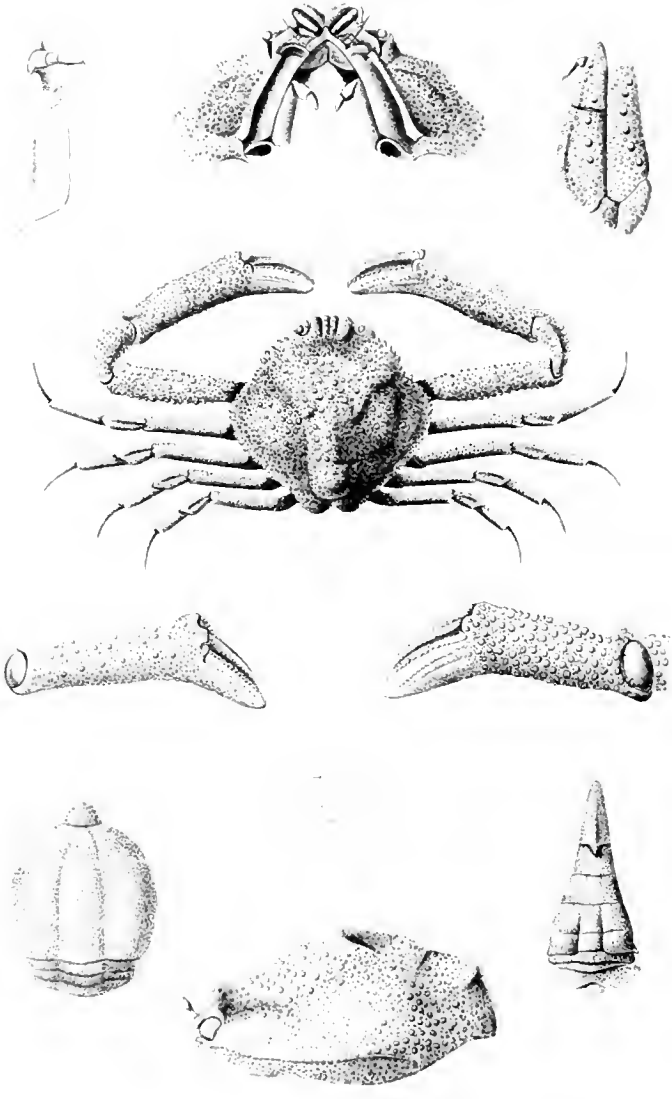


Fig. 10 The plate illustrating *Ebalia nux* in Milne-Edwards (1883), *Recueil de figures des Crustacés nouveaux ou peu connus*

claiming that if he did not reply to it this was not through lack of courtesy but simply because he was too busy with his professional duties as a cleric.

In reply, Pocock (1890*b*) rejected the suggestion that he had a guilty conscience since, he wrote, he had had no idea that Norman would take exception to his treatment of the species. Far from a discourtesy, he felt that his designation of Norman's specimens as types of the species was 'both expedient and just.' Finally, he dealt with his own failure to refer to Milne-Edwards' illustration of *E. nux* in the '*Recueil* . . .' (1883), pointing out that despite Norman's reference to the Museum's 'magnificent library' neither it nor the libraries of the Royal, Linnean or Zoological Societies contained a copy of this work. Furthermore he quoted a letter from Milne-Edwards stating that only 50 copies of the '*Recueil* . . .' had been produced, that most of these had been sent to naturalists then working in carcinology (not including Pocock, of course), that only a few copies had been offered for sale and that the work had consequently become almost unobtainable.[4] Under the circumstances, suggested Pocock, he could hardly be blamed for not having referred to it.

As far as I am aware, this was the end of the published exchanges, for in the next volume of the *Annals and Magazine* both protagonists published on other topics. Norman continued to be attributed consistently with the authorship of *E. nux* for a further 86 years (see Turkay, 1976), though as early as 1918 Pesta had suggested that it should really go to Milne-Edwards. Whether or not this is so depends upon whether Milne-Edwards (1883) counts as a true publication, for if it does not, Pocock is the author and the types are the *Porcupine* specimens which he designated. However, although Milne-Edwards' action in producing the '*Recueil* . . .' would be deplored today, the fifty copies produced were 'obtainable, when first issued, free of charge or by purchase', therefore fulfilling the criteria for publication in Article 8(a)(2) of the *International Code of Zoological Nomenclature*. Moreover, Dr. L. B. Holthuis pointed out to me that the 'Recueil' has already been recognised nomenclaturally since at least two names published in it (*Pantomus* and *P. parvulus*) have been placed on the *Official List*. Consequently, the correct attribution of the species is *Ebalia nux* A. Milne-Edwards, 1883, and the type must be a specimen from the *Travailleur* material in Paris, preferably that on which Milne-Edwards' illustration was based.

THE 'NORMAN COLLECTION' AND ITS ACQUISITION BY THE BRITISH MUSEUM (NATURAL HISTORY)

As a young Curator of Crustacea Malacostraca at the British Museum (Natural History) in the mid 1960s, I was aware of the 'Norman Collection' as one of the larger 'named' collections within my care. The specimens were distributed through the sectional collection, but the most tangible evidence of its original unity was, and is, a single large ledger in which some 50,000 specimens were registered under the general accession number 1911:11:8. A much smaller number of specimens identified as having been purchased from Norman appear in the general register at various times between 1898 and 1911, and a few even before this period. The official *History of the Collections* up to 1900 (British Museum (Natural History) 1906) contains a reference to the purchase of the Norman Collection in 1898 and this is repeated in Stearn's (1981) excellent general account of the history of the Natural History Museum. Otherwise, the acquisition of the

[4] A note to this effect, apparently in Pocock's handwriting and with a reference to Milne-Edwards' letter, is attached to the British Museum (Natural History) copy of the '*Recueil* . . .' which was obtained subsequently.

collection does not seem to have been documented and the following notes are an attempt to rectify this.[5]

Alfred Merle Norman was born at Exeter in 1831 and was educated at Winchester and Christ Church, Oxford, where he obtained a B.A. in 1852 and was ordained in 1856. As a cleric he worked almost entirely in the Durham diocese, being Curate at Houghton-le-Spring from 1864 to 1866 and Rector of the coal-mining parish of Burnmoor from 1866 to 1895. He had been appointed Hon. Canon of Durham in 1885 and returned to Houghton in 1895 as Rector and Rural Dean. He retired on medical grounds in 1898, moving to Berkhamstead where he lived until his death in 1918.

Norman had already shown an interest in natural history during his school days and published an account of the molluscs of Oxfordshire in 1851 while he was still an undergraduate. The two years before his ordination were spent on the Isle of Cumbrae and here he began his lifelong interest in marine biology.

During the 1860s he was active in the British Association Dredging Committees, publishing many of the results of dredging in northern waters and dealing with a wide range of taxonomic groups. In the final Shetland dredging report published in 1868, for instance, Norman dealt with the Crustacea, Tunicata, Polyzoa, Echinodermata, Actinozoa, Hydrozoa and Porifera.

In 1882 he completed Bowerbank's unfinished Ray Society volume on the sponges, based partly on his own collection, and in 1890 he published a 'Revision of the British Mollusca', having been at one time the President of the British Conchological Society.

Norman's main interest, however, was in the crustaceans and he published numerous papers on a wide range of crustacean groups, including an account of *The Crustacea of Devon and Cornwall* published in collaboration with Thomas Scott in 1906.

Norman was a central figure in British marine science from the 1860s to the end of his life. He also had strong contacts with foreign specialists, particularly in France, being invited to participate with John Gwyn Jeffreys in the cruise of the *Travailleur* in 1880.

In common with many of his contemporaries, Norman amassed a biological collection both from his personal collecting excursions and by purchase and exchange. To encourage and solicit exchanges he published catalogues of his collection, including two lists of his crustacean holdings. The first of these, which appeared in 1886, listed 1362 species, while the second, published in 1905, listed 2808 species. He was thus clearly still actively adding to his collection well into his 70s, despite having arranged to sell it to the Natural History Museum, and part of it having been already received by the Museum and paid for!

Norman offered his collection to the British Museum (Natural History) in a letter to the Director Sir William Flower, dated 2 February 1898, explaining that he was due to retire in April and would be moving to Berkhamstead. Asked for an indication of the extent of the collection on March 1 Norman sent a manuscript list and a copy of his printed catalogue. After some deliberation Flower offered Norman a total of £2,000 for the collection but explained that such a sum could not be found out of the funds available for purchase in a single year. Instead, he suggested that both the transfer of the collection to the Museum, and the payment, should be spread over a number of years, the first payment of £500 being paid on receipt of the first part of the collection.

On 31 March 1898 Norman wrote his acceptance of the general offer. But he pointed out that the first instalment would be worth much more than £500 and suggested that a

[5] In this section the details of Norman's career are taken from his obituaries by Stebbing (1919*a* and *b*), and from the excellent account of Norman's life and work by Mills (1980). The references to the acquisition of the Norman Collection by the Natural History Museum are from the Director's letter files and the official minutes of the Trustees meetings in the Museum archives. I am grateful to the Museum authorities for permission to consult and quote from these documentary sources.

guarantee should be drawn up to protect both parties, arranging for a second £500 to be paid 5 years later, if Norman was still alive, and the balance to be paid on his death.

Flower was not keen on such an arrangement and pointed out that, having paid for the first part of the collection, the Museum had no guarantee that the remainder of the material would remain in its current state and not deteriorate for various reasons.

On April 16 Norman replied somewhat defensively. He admitted that his catalogues may not be absolutely correct since some of the listed material might already have become dried up or lost. However, such possible losses would be more than compensated for by the fact that he intended to continue amassing material as long as he was able. Moreover, he wrote, the collection already contained items not in the catalogues – including 'Molluscs dredged by the French expedition in the 'Talisman' purchased [for £14] from the Marquis de Folin.'

Two days later he wrote to Flower yet again, still concerned that he should have some guarantee that the Trustees of the Museum would not renege on the agreement. In Flower's reply, dated 21 April, the Director still resisted having a formal guarantee, saying that he was sure that Norman 'will find the Trustees as safe as the Bank of England, even when not prompted by me'. This was somewhat prophetic, for Flower's Directorship was to last only a further four months. He was already 66 years old and his by no means robust constitution had suffered a collapse the previous October. He resigned his post in August 1898, to be succeeded by E. Ray Lankester, and died the following July. The arrangement of the purchae of the Norman collection was therefore among his final official acts, the results being presented at two of the last few monthly Trustees meetings that he attended.

At the first of these, on 23 April 1898, Flower simply reported that Norman had offered his collection of more than 10,000 species of mainly marine invertebrates for a total of £2000, to be paid for in instalments as they were delivered to the Museum. This was approved by the Trustees and Norman's letter to Flower accepting the arrangement was written the same day. At the next meeting, on 25 June 1898, Flower was able to report the receipt of the first instalment of the collection, including some terrestrial and freshwater molluscs, totalling some 26,191 specimens. The Trustees approved the payment of the first £500.

The receipt of the second instalment was reported to the Trustees by Lankester on 24 March 1900. This instalment 'included the remainder of Dr. Norman's collection of British Echinodermata, 3000 species of Entomostraca, 49 species of Mediterranean Copepods, 925 microscopic preparations of Entomostraca, a large series of Polychaeta, and collections of Tunicata, Mollusca, Crustacea, Cirripedia, Anthozoa etc.' The Trustees approved the payment of a second £500.

No further Norman material came to the Museum during Lankester's turbulent Directorship and, as noted above, the publication of the second edition of the 'Museum Normanianum' in 1906 suggests that Norman was actively increasing his collection at this time. However, In January 1910, Sydney Harmer, the Keeper of Zoology, was able to report to Lankester's successor, Lazarus Fletcher, the receipt of the third instalment of the Norman collection, consisting of 'about 3,290 specimens of sponges (including 195 types and 185 co-types), and of a number of specimens of Hydrozoa, Anthozoa, Crustacea, etc.'

At the Trustees meeting of 22 October 1910 approval was given for the payment of £200 for this third instalment, the Trustees presumably being made aware that the outstanding instalment was much larger.

This fourth and final instalment was received in November 1911 and included the 50,000 crustaceans mentioned above. A payment of £500 was authorized immediately and the payment of the final £300, being the balance of the originally agreed £2000, was

approved in June 1912, presumably after the extent and state of the fourth instalment had been ascertained.

ACKNOWLEDGEMENTS

I am very grateful to Dr. L. B. Holthuis of the Rijksmuseum van Natuurlijke Historie, Leiden, for his valuable constructive criticism of an early draft of this paper. I am also grateful to the Trustees of the British Museum (Natural History) for permission to consult, and quote from, the Museum's archives, and to the staffs of the libraries and the Crustacea Section of the Museum for their unstinting assistance.

APPENDIX. AUTHORSHIP ATTRIBUTION OF THE SPECIES

The following restricted synonomies of the four crab species dealt with gives an indication of the range of authorship attribution in the literature.

Dorynchus thomsoni
Dorynchus thomsoni, Norman (Thomson, 1873)
Lispognathus thomsoni, Norman (Milne-Edwards, 1881).
Lispognathus thompsoni, (A. M. Edw.) (Anon, 1884)
Lispognathus Thomsoni (A. M.-Edw.) (Filhol, 1885)
Lispognathus Thomsoni, A. M. Edw. (Perrier, 1886)
Dorynchus Thomsoni, Norman (Perrier, 1886)
Lispognathus Thomsoni (Pocock, 1889)
Lispognathus thomsoni, Norman (Bourne, 1890)
Lispognathus thomsoni, Norman (Milne-Edwards and Bouvier, 1900)
Lispognathus Thomsoni Norm. (Hansen, 1908)
Lispognathus Thomsoni, Norman (Bouvier, 1922)
Archaeopsis thomsoni (Norman) (Rathbun, 1925)
Dorhynchus Thomsoni Norman (Bouvier, 1940)
Archaeopsis thomsoni (Norman) (Barnard, 1950)
Dorhynchus thomsoni Thomson (Holthuis, 1962)
Dorhynchus thomsoni Thomson (Zariquiey, 1968)
Dorhynchus thomsoni Thomson (Christiansen, 1969)
Dorynchus thomsoni Thomson (Ingle, 1980)
Dorhynchus thomsoni Thomson (Manning and Holthuis, 1981)
Archaeopsis thomsoni (Thomson) (Griffin and Tranter, 1986)

Rochinia carpenteri
Amathia carpenteri, Norman (Thomson, 1873)
Scyramathia carpenteri Norman (Milne-Edwards, 1880*a*)
Scyramathia Carpenteri (A. M.-Edw.) (Filhol, 1885)
Scyramathia Carpenteri, Norman (Perrier, 1886)
Anamathia Carpenteri (Pocock, 1889)
Anamathia Carpenteri, Norman (Bourne, 1890)
Scyramathia Carpenteri, Norman (Milne-Edwards and Bouvier, 1900)
Scyramathia Carpenteri (Norman) (Doflein, 1904)
Scyramathia carpenteri Norman (Rathbun, 1925)
Rochinia Carpenteri Norman (Bouvier, 1940)
Rochinia carpenteri (Norman) (Monod, 1956)

Rochinia carpenteri (Thomson) (Sivertsen and Holthuis, 1956)
Rochinia carpenteri (Thomson) (Zariquiey, 1968)
Rochinia carpenteri (Thomson) (Ingle, 1980)

Cymonomus granulatus
Ethusa granulata n.s. (Thomson, 1873)
Ethus granulata, Norman (Norman, 1880)
Cymonomus granulatus (Norm.) (Milne-Edwards, 1883)
Cymonomus granulatus (A. M.-Edw.) (Filhol, 1885)
Cymonomus granulatus, Norman (Perrier, 186)
Cymonomus granulatus, Norman (Milne-Edwards and Bouvier, 1900)
Cymonomus granulatus (Norman) (Doflein, 1904)
Cymonomus granulatus (Norman (Ihle, 1916)
Cymonomus granulatus Norman (Bouvier, 1940)
Cymonomus granulatus (Norman ex Thomson) (Monod, 1956)
Cymononus granulatus (Thomson) (Zariquiey, 1968)
Cymononus granulatus (Thomson) (Türkay, 1976)
Cymononus granulatus (Thomson) (Ingle, 1980)
Cymonomus granulatus (Thomson) (Manning and Holthuis, 1981)

Ebalia nux
Ebalia nux, Norman (Norman, 1880)
Ebalia nux (Norm.) (Milne-Edwards, 1883)
Ebalia nux, Norman, MS (Pocock, 1889)
Ebalia nux, Norman (Bourne, 1890)
Ebalia nux, Norman (Milne-Edwards and Bouvier, 1900)
Ebalia nux Norman (Pesta, 1918)
Ebalia nux Milne-Edwards, 1881 (in note in Pesta, 1918)
Ebalia nux, Norman (A. Milne-Edwards, 1881) (Bouvier, 1922)
Ebalia nux Norman (Nobre, 1931)
Ebalia nux Norman (mss) (Bouvier, 1940)
Ebalia nux Norman ex Milne-Edwards, (Monod, 1956)
Ebalia nux Norman en Milne-Edwards, 1883 (Zariquiey, 1968)
Ebalia nux Norman 1883 (Türkay, 176)
Ebalia nux A Milne-Edwards (Ingle, 1980)

REFERENCES

Anon, 1884. *Nature, Lond.*, **29**: p. 531.

Barnard, K. H. 1950. Descriptive catalogue of South African Decapod Crustacea (Crabs and Shrimps). *Annals of the South African Museum* **38**: 1–837.

Bourne, G. C. 1890. Report on a trawling cruise in H.M.S. 'Research' off the south-west coast of Ireland. *Journal of the Marine Biological Association of the United kingdom* **1**: 306–323.

Bouvier, E. L. 1922. Observations complémentaires sur les Crustacés Décapodes (abstractions faites des Caridea), provenant des campagnes de S.A.S. le Prince de Monaco. *Résultats des Recherches Scientifiques accomplies par le Prince Albert I. Monaco* **62**: 1–106.

—— 1940. Décapodes Marcheurs. *Faune de France* **37**: 1–404. Paris

Carpenter, W. B. and Jeffreys, J. G. 1870. Report on deep-sea researches carried on during the months of July, August and September 1870, in H. M. Surveying-ship 'Porcupine'. *Proceedings of the Royal Society of London* **19**: 146–221.

Christiansen, M. E. 1969. *Crustacea Decapoda Brachyura*. Marine Invertebrates of Scandinavia, No. 2, Univ. Oslo, 143pp.

Dollein, F. 1904. Brachyura. *Wissenschaftliche Ergebnisse der Deutschen Tiefsee-Expedition auf dem Dampfer 'Valdivia' 1898–1899, Jena* **6**: 1, XIV, 1–314.

Filhol, H. 1885. *La vie au fond des mers. Les explorations sous-marins et les voyages du Travailleur et du Talisman*. Masson, Paris, VIII + 301pp.

Griffin, D. J. G. & Tranter, H. A. 1986. The Decapoda Brachyura of the Siboga Expedition. Part VIII. Majidae. *Siboga Expedition* **39**: 1–335.

Hansen, H. J. 1908. Crustacea Malacostraca, I. *The Danish Ingolf Expedition* **3** (2): 1–120.

Holthuis, L. B. 1962. Forty-seven genera of Decapoda (Crustacea); proposed addition to the Official List. Z.N.(S.) 1499. *Bulletin of Zoological Nomenclature* **19**: 232–253.

Ihle, J. E. W. 1916. Die Decapoda Brachyura der Siboga Expedition. II. Oxystomata, Dorippidae. *Siboga Expeditie* **39(b)**: 97–158.

Ingle, R. W. (1980) *British Crabs*. 222pp. Oxford and London, Oxford University Press and British Museum (Natural History).

Jeffreys, J. G. 1869. The deep-sea dredging expedition in H.M.S. 'Porcupine'. *Nature, London* **1869**, 135–137.

Kemp, S. 1910. The Decapoda collected by the 'Huxley' from the north side of the Bay of Biscay in August, 1906. *Journal of the Marine Biological Association of the United Kingdom* **8**: 407–420.

Lankester, E. R. 1903. On the modification of the eye peduncles in crabs of the genus *Cymonomus*. *Quarterly Journal of the Microscopical Society* **47**: 439–463.

Lubbock, J. 1893. *The Beauties of Nature and the Wonders of the World we live in*. XIV + 427pp. London.

Manning, R. B. & Holthuis, L. B. 1981. West African brachyuran crabs (Crustacea: Decapoda). *Smithsonian Contributions to Zoology* **306**: XII + 379pp.

Marion, A. F. 1883. Considérations sur les faunes profondes de la Méditerranée. *Annales du Musée d'Histoire Naturelle de Marseille – Zoologie* **1** (2): 1–50.

Mills, E. L. 1980. One 'different kind of gentleman': Alfred Merle Norman (1831–1918), invertebrate zoologist. *Zoological Journal of the Linnean Society* **68**: 69–98.

Milne-Edwards, A. 1880*a*. Compte rendu sommaire d'une exploration zoologique faite dans le golfe de Gascogne a bord du navire de l'Etat le *Travailleur*. *Compte rendue hebdomadaire des Seances de l'Academie des Sciences, Paris* **91**: 355–360.

—— 1880*b*. Reports on the results of dredging under the supervision of Alexander Agassiz, in the Gulf of Mexico, and in the Caribbean Sea, 1877, '78, '79, by the U.S. Coast Survey Steamer 'Blake', Lieut. Commander C. D. Sigsbee, U.S.N., and Commander J. R. Bartlett, U.S.N., Commanding. VIII. Études préliminaires sur les Crustacés. *Bulletin of the Museum of Comparative Zoology, Harvard College* **8**: 1–68.

—— 1881. Compte rendu sommaire d'une exploration zoologique faite dans l'Atlantique au bord du Navire le Talisman. *Compte rendu hebdomadaire des Séances de l'Academie des Sciences, Paris* **93**: 931–936.

—— 1883. *Recueil de figures de Crustacés nouveaux ou peu connus*. Part 1, pp. 1–3, plates 1–44. Paris.

—— & **Bouvier, E. L.** 1900. Brachyures at Anomoures. *In*. Crustacés Décapodes, Première Partie. *Expédition Scientifiques du Travailleur et du Talisman pendant les annees 1880, 1881, 1882, 1883*. 396pp. Paris.

—— & —— 1902. Reports on the results of dredging under the supervision of Alexander Agassiz in the Gulf of Mexico (1877–78), in the Caribbean Sea (1878–79), and along the Atlantic Coast of the United States (1880), by the U.S. Coast Survey Steamer 'Blake', Lieut. Com. C. D. Sigsbee U.S.N., and Commander J. R. Bartlett, U.S.N., Commanding. XXIX. Les Dromiacés et Oxystomes. *Memoirs of the Museum of Comparative Zoology, Harvard College* **27** (1): 1–127.

Monod, Th. 1956. Hippidea et Brachyura ouest-africains. *Memoires de l'Institut Francais d'Afrique Noire*, **45**: 1–674.

Nobre, A. 1931. *Crustáceos Decápodes e Stomatopodes marinhos de Portugal*. 307pp.

Norman, A. M. 1869. Shetland final dredging report. Pt. II. On the Crustacea, Tunicata, Polyzoa, Echinodermata, Actinozoa, Hydrozoa and Porifera. *Report of the British Association for the Advancement of Science* **38**: 247–336.

1880. Notes on the French exploring voyage of 'Le Travailleur' in the Bay of Biscay. *Annals and Magazine of Natural History* **6**: 430–456.

—— 1886. *Museum Normanianum or a Catalogue of the Invertebrata of Europe, and the Arctic and North Atlantic Oceans, which are contained in the collections of the Rev. Canon A. M. Norman, M.A., D.C.L., F.L.S. III. Crustacea*. Houghton-Le-Spring, 26pp.

—— 1890. *Ebalia nux*: a reply to Mr. R. I. Pocock. *Annals and Magazine of Natural History* **5**: 342–346.

—— 1905. *Museum Normanianum, or a catalogue of the Invertebrata of the Arctic and North Atlantic Temperate Ocean and Paleoarctic Region, which are contained in the collection of the Rev. Canon A. M. Norman, M.A., D.C.L., LL.D., F.R.S., F.L.S., &c. III Crustacea*. Second Edition, Durham, 47pp.

—— & **Scott, T. 1906.** *The Crustacea of Devon and Cornwall*. I–XV + 232pp. London

Perrier, E. 1886. *Les explorations sous-marines*. iv + 352pp. Paris.

Pesta, O. 1918. *Die Decapodenfauna der Adria: Versuch einer Monographie*. Leipzig and Wien. X + 500pp.

Pocock, R. I. 1889. Report of a deep-sea trawling cruise off the S.W. coast of Ireland, under the direction of Rev. W. Spotswood Green. *Annals and Magazine of Natural History* **4**: 425–431.

Pocock, R. I. 1890*a*. On *Ebalia nux*, Milne-Edwards. *Annals and Magazine of Natural History* **5**: 101–103.

—— 1890*b*. On *Ebalia nux*, Milne-Edwards: a reply to the Rev. Canon Norman. *Annals and Magazine of Natural History* **5**: 469–472.

Rathbun, M. J. 1925. The spider crabs of America. *Bulletin of the United States National Museum* **129**: XX + 613pp.

Rice, A. L. 1986. *British Oceanographic Vessels, 1800–1950*. 193pp. London.

Sivertsen, E. & Holthuis, L. B. 1956. Crustacea Decapoda (the Penaeidea and Stenopodidea excepted). *Report on the Scientific Results of the 'Michael Sars' North-Atlantic Deep-Sea Expedition 1910*. Bergen **5** (12): 1–54.

Stearn, W. T. 1981. *The Natural History Museum at South Kensington. A history of the British Museum (Natural History) 1753–1980*. XVIII + 414pp. London.

Stebbing, T. R. R. 1918–1919. Obituary of A. M. Norman. *Proceedings of the Linnean Society of London* **131**: 58–60.

—— 1919. Alfred Merle Norman, 1831–1918. *Proceedings of the Royal Society of London* (B) **90**: xlvi–l.

Thomson, C. W. 1873. *The Depths of the Sea*. 527pp. London.

Türkay, M. 1976. Decapoda Reptantia von der portugiesischen und marokkanischen Küste. Auswertung der Fahrten 8, 9c (1967), 19 (1970), 23 (1971) und 36 (1975) von F.S. 'Meteor'. *'Meteor' Forschungsergebnisse*, Reihe D Biologie **23**: 23–44.

Waren, A. 1980. Marine Mollusca described by John Gwyn Jeffreys, with the location of the type material. *Special Publication. Conchological Society of Great Britain and Ireland*, 60pp.

Zariquiey Alvarez, R. 1968. Crustáceos Decápodos Ibéricos. *Investigación Pesquera*. (Barcelona) **32**: XV + 510pp.

Bull. Br. Mus. Nat. Hist. (Hist. Ser.) **18**(1): 25–113 Issued 31 May 1990

A memoir and bibliography of Michael Rogers Oldfield Thomas, F.R.S.

J. E. HILL

Department of Zoology, British Museum (Natural History), Cromwell Road, London SW7 5BD

CONTENTS

BIOGRAPHY

Michael Rogers Oldfield Thomas served the Trustees of the British Museum and subsequently of the British Museum (Natural History) from 1876 until his retirement in 1923, continuing to work at the Museum almost until his death in 1929. Joining the staff of the Department of Zoology in 1878 as the Assistant in charge of mammals, he devoted the following fifty one years to the development and increase of the mammal collections, to a voluminous correspondence, and especially to a prodigious output of papers and writings that without doubt establishes him as the most prolific of mammalogists in variety and number of publications, and in numbers of newly described taxa. His contribution to the then emergent science of modern mammalogy is so great that few taxonomic or systematic studies of mammals written since his era can fail to include at least one name that he proposed, and modern faunal studies, revisions and monographs almost invariably include several and sometimes many references to his writings.

Despite this prodigality, there exists no published bibliography to document his achievements, and, unlike the present age when no doubt his contemporaries and peers might be invited to produce a commemorative volume or Festschrift, the end of his career was marked only by relatively brief obituary notices (Hinton, 1929; Pocock, 1930). While it might be said that the mammalian collection of the British Museum (Natural History) is in itself a memorial to Oldfield Thomas[1], who did so much to create and shape it, at a distance of some sixty years from his death it seems opportune to review the contribution

[1] Always known among his family as Oldfield (his mother's maiden name), he invariably styled himself Oldfield Thomas, ignoring his other given names. His full name or his full initials are only rarely cited, and then chiefly by the pedantic.

made by this most remarkable of mammalogists, and to document the vast output of papers, reports and other publications that won him world-wide recognition as a leader and innovator in his chosen field.

Oldfield Thomas was born on 21 February, 1858 at Millbrook in Bedfordshire, England. The son of a clergyman, the Reverend J. H. Thomas, who was subsequently appointed to the Archdiaconate of Cape Town, Thomas spent several of his early years in South Africa, where he displayed a youthful interest in natural history by collecting insects on the slopes of Table Mountain. When his father returned to England to become Vicar of Hillingdon, near Uxbridge in west London, Thomas was sent to Haileybury, then a relatively recently founded public school (in England in fact a more or less exclusively private establishment) at Hertford, but apparently did not prove to be a promising scholar. At the age of eighteen he secured a clerkship in the office of the British Museum at Bloomsbury, of which at that time the natural history collections formed an integral part, but his interest in this field led him to hope for a post as an Assistant in the Department of Zoology, under the formidable Dr. Albert Gunther, then its Keeper. With this in mind, Thomas attended a course of lectures by T. H. Huxley at South Kensington for the next two years. In 1878 his hopes of a zoological career were fulfilled by a transfer to the zoological staff with an Assistantship that he was to hold until his official retirement on 21 February, 1923.

At first interested in invertebrate animals and especially in Echinoderms with which rumour had already suggested he would work, he was dismayed when after a short period Gunther assigned him to the study and curation of mammals. In later life Thomas would recount how despite his protestations, the autocratic Keeper insisted that he should 'do the mammals', and he would aver that the vision of the countless sheep and goats that passed through his mind had led him to hate these animals for ever. Perhaps it is significant that subsequently he did ignore their systematics to a large extent, leaving this work to others, except possibly when impelled by his enthusiasm to write a description of one hitherto unknown, and so add another new name to his ever increasing total. One can only speculate to what extent he would have influenced the classification of any other group of animals had Gunther decided otherwise: his career suggests that in the Mammalia Thomas found one to which his talents were admirably suited.

Some impressions of Thomas survive in the obituary notices by his contemporaries M. A. C. Hinton (1929) and R. I. Pocock (1930), and in the personal recollections of the late R. W. Hayman, who joined his small staff in the Mammal Room as a very young man in 1921. Pocock, who knew Thomas from his early days in 1885 provides a vivid pen picture of this dedicated worker. He was, Pocock remarks, like any average young Englishman of the period who had been reared in a well-ordered household, found his level at public school, learnt the bad taste of self-advertisement, and had acquired the qualities of 'fair play': in fact, an exemplar of the typical upper middle class virtues of the age.

A single-minded man almost wholly devoted to his work, Thomas had a practical and methodical nature, with few intellectual pretensions and little aesthetic appreciation. Although Pocock remarks that he had gained little profit from the educational system then in vogue, his impeccable coinings of new names in profusion indicates at least a reasonable understanding of Greek and Latin, and the quality of his writing shows a more than passing grasp of English grammar and composition. He had, according to Pocock, no appreciation of art or literature, classical or otherwise, yet his choice of names shows a wide acquaintance with the legendary figures of classical mythology, and, in one little known instance, some knowledge of painting in his proposal (0432) of the name *Fornarina* for a naked mole-rat, after a celebrated nude by Titian. He had some liking for music, but appears to have gained no real pleasure from reading, confining himself to the daily newspaper, an occasional magazine, or to travel books. He was by all

accounts an eminently sociable person, preferring conversation to books, and with an aversion to solitude that amounted almost to pathological dislike. When working he had a strong preference for the presence of another person: the late G. W. C. Holt fulfilled this need for company in Thomas' later years, carrying out his clerical duties in the same room and being there, when required, to undertake small tasks or errands.

In his earlier years Thomas engaged in a variety of games and sports, such as billiards, cricket and lawn tennis: he played lacrosse for a while and was a passable marksman, as a volunteer in the Artist's Corps. Almost to the end of his life he played that most Victorian and sometimes vicious of games, croquet, devoting his summer holidays to tournaments at various seaside resorts. Although he had travelled quite widely in Europe in the early days of his career and indeed engaged in some minor collecting expeditions, he seems to have had little interest in the countryside and its scenery, or even in its flora and fauna. Collecting seems to have interested him as a means to the essential objective of providing specimens. On an occasion in later life when his attention was drawn to the beauty of the night sky he is reputed to have observed that it was a great pity that one could not collect the stars!

Quite unconcerned with social importance or professional advancement within the Museum, Thomas also lacked any conceit in his own achievements. Although for many years he maintained a personal record of the Latin names that he had proposed, it was kept more probably to avoid the risk of pre-occupying his own coinings, or of using the same name too frequently, rather than from vanity, but from time to time he did add a cumulative total. Eventually it seems that the task became too wearisome and he ceased to keep this record, relying instead upon his memory. He declined the opportunity of promotion to higher, mainly administrative posts so that he might remain unfettered in his work with the collection, and refused to be drawn into controversies such as that surrounding the relics of Piltdown Man, even when his friend and colleague, the American mammalogist G. S. Miller correctly surmised (1915, 1918) that the jaw was that of a chimpanzee and so came under fire from more immediate colleagues in the Museum.

Thomas' pragmatic approach to life, tempered by shrewd commonsense and judgement, led him to choose his friends and associates wisely, or to select loyal and trusted collectors with whom he would have only sporadic contact once they were in the field. At the same time, by persuasion and perseverance he was able to interest wealthy or influential sponsors in his collecting projects, sometimes with the promise of nomenclatural immortality when their patronyms would appear as the names of the new species or subspecies that inevitably would be discovered. Others he would convince that their best interests lay in furthering the progress of the National Collection, as he liked to call it, perhaps by working as his largely unpaid assistants at South Kensington. No doubt these 'unofficial workers' found inspiration in the very considerable determination and prodigious capacity for work shown by the 'Boss', as he was known to his intimates in his middle years. Such qualities had brought him professional recognition in his election to the Fellowship of the Royal Society in 1901, an honour he valued greatly, and, although he was not one to seek public office, his election to the Council of the Zoological Society of London in the latter part of the nineteenth century.

His marriage in 1891 to Mary Kane, the daughter of Sir Andrew Clarke, marked a watershed in his career. His wife, similarly Victorian, was in many ways everything that Thomas was not: a good amateur pianist, with literary tastes, and a follower of orthodox religion, she was in some respects almost his opposite. There were no children of the marriage, and when after a few years his wife inherited a small fortune, Thomas found the independence that was to enable him to stand aloof from the office-seeking, lecturing and popular writing that many of his generation and others since have found necessary to supplement an official stipend. More than that, his wife herself became interested in

natural history, and, devoted to her husband and his work, readily agreed that as much money as could be spared should be diverted into supporting mammal collectors in many parts of the world, or into financing expeditions with such collecting as their principal objective.

Thomas' correspondence survives in the Museum, although only of the incoming letters, there being no copies of his replies. It shows him to have been a voluminous correspondent, in touch with all of his prominent colleagues at home and abroad. It is almost a roll call of the height of Empire, with letters from famous explorers, hunters and colonial officials that Thomas had enlisted as part-time collectors. Many letters are concerned with others whose collecting he financed from his own pocket, some quite amusing when read today and throwing an unexpected light on the way that Thomas built the collection in his charge. Always careful in laying out his money, he occasionally met his match: letters from Knud Andersen, for example, show that when offered employment he too could drive a hard bargain.

Occasionally Thomas would write letters to newspapers and magazines: cuttings of some that evidently he valued or thought might interest posterity he added to his personal volumes of his writings. His pragmatic outlook characterises his suggestions for an easily made ear-plug for soldiers in the firing line (0751), that pedestrians should use the road and footpath in a disciplined fashion to avoid collisions with traffic or with bearers of advertising sandwich-boards (0844), or his proposal after the First World War that the German Fleet should be sunk in such a way and position that the wrecks would provide a breeding ground for fish (0848). Interested in the merits of simplified spelling (0684, 0700, 0813), he also enthused over starvation as a cure for influenza (1005), and advocated the learning of Braille by the sighted as an aid to sleep: in this way it was possible to read in bed in a darkened room, or with arms, hands and book or magazine in the warmth under the bed linen (1017). He had pronounced views on 'legalised suicide' as a form of euthanasia (0507) that eventually he was to carry to their logical conclusion.

For many years Thomas seemed unduly concerned with his health, soon after his marriage experiencing heart palpitations and other unexplained symptoms. As time passed he gave up strenuous games and drifted slowly into a condition bordering on semi-invalidism, apparently convinced that he had only a short time to live. He was advised that a mainly vegetarian diet might improve the situation, and with typical determination and tenacity he adopted this new regime. The results were so beneficial, for whatever reason, that he soon became an ardent advocate of this new way of life. Probably very unfairly his friends regarded him as a hypochondriac, perhaps even something of a crank: he was, it seems, a valetudinarian, highly solicitous of his health, and especially concerned with the effects of diet and sometimes other unconventional treatments, such as daily massage. A wider interest in subjects beyond the narrow field of systematic mammalogy might have helped but without these broader horizons he had little beyond his work and in later life would occupy himself at home in knitting, or in listening to the radio when regular broadcasting began. Always a man of precise and ordered methods when studying specimens or writing, he carried routine into his daily activity: after a midday snack he would retire to a private darkened room, there to sleep for an hour in an old armchair before returning to work for the afternoon, a practice not unknown among his successors. During this rest period the wrath of the mighty would descend upon any unwise person who disturbed him, unless perchance they brought news of fresh funds becoming available for collecting expeditions, or of new mammals that he might describe.

He continued after his official retirement in 1923 to work as though nothing had happened. His wife, upon whom he had become increasingly dependent, predeceased him in May, 1928. For some while he carried on unchanged, but as the months went by he clearly missed her more and more, becoming less interested in his work, her death

having been a severe blow from which he was unable to recover. The deliberate termination of his life by his own hand in June, 1929 came as a great shock to his many friends and admirers, although no surprise to those close to him: the note that he left revealed his inner stresses and made it plain that he could no longer face life alone without his partner.

Thomas left the greater part of his fortune and that of his wife as a collecting fund for the Museum, but it is characteristic of this modest and unassuming man that to the last he thought of the comfort and convenience of others. For most of his working life he had ascended (and descended) four long flights of stairs from the Main Hall of the Museum to the Mammal Room, then on the third floor and now part of the Department of Botany. Shortly before his death he paid for the installation of a lift to relieve the staff by overcoming this climb, and which bears a plaque (Pl. 3) commemorating his generosity.

The Department of Zoology when Thomas joined it in 1878 was housed in the British Museum at Bloomsbury, with the other natural history collections, the Waterhouse building in South Kensington being then incomplete and not ready for occupation. The mammal collections had from 1837 to 1874 been the responsibility of the eminent naturalist John Edward Gray, among many other duties. Gray had established a system of accession and registration, and had assembled a substantial nucleus of the study collection. He produced a number of catalogues of the material under his care, these gradually taking on a monographic nature going beyond simple listing. His successor as Keeper of Zoology, Dr. Albert Gunther had for a short while taken charge of the mammal collection and had intended to prepare a catalogue of the Marsupialia and Monotremata. However, with the appointment of Thomas, it seems that Gunther soon realised that he had made a wise decision, and relinquished the task to this energetic and painstaking newcomer. Once the move of the collection to South Kensington was completed in 1882, Thomas began seriously to continue the work of cataloguing and monographing the collection after the fashion of the time. The Catalogue of the Marsupialia and Monotremata appeared in 1888 (0065): that this was to be the precursor of similar catalogues of the entire collection seems evident from the manuscript listings of the Museum holdings of mammals that Thomas prepared about that time and which even today are valuable in tracing the history of early material. Other papers in this period quickly established Thomas as a rising mammalogist, and it soon became evident that in one way or another he would make a significant contribution to this field of science.

The final decade of the nineteenth century saw a profound change in mammalogy. Until then the subject had been dominated by a largely typological concept, more often than not based on very small numbers of specimens, most of them indifferently preserved, and often without reliable locational data. However, a number of American mammalogists, led by Dr. C. Hart Merriam and charged with a survey of the mammalian fauna of the United States, realised that the species concept in this sense had limitations when such large faunal areas were studied. In its place, they began to study variation by collecting widespread series of carefully prepared specimens, complete with skulls, and labelled with accurate details of locality, altitude, date and gender. Much interesting information was soon obtained, and in particular the details of local variation became clear, leading to the recognition not only of further species but also of many previously unsuspected local races or subspecies.

The publication of such results immediately alerted Thomas to the implications of this new approach to his subject. Very quickly he realised that what was true of North America must apply equally to the rest of the world, and offered almost unlimited opportunities of augmenting the collection in his charge with new and exciting representatives of other mammal faunas. He began to apply these new ideas to the fauna of the Old World and of South America, encouraging collecting by local residents, colonial officials and sportsmen, financing independent collectors from his own now not

inconsiderable means, and by finding wealthy sponsors. His decision to undertake what was effectively almost a survey of the mammals of the world led to a complete change in the nature of his work which became increasingly concerned with the identification of the many specimens that flowed into South Kensington, and with the preparation of short papers that for the most part consisted of the descriptions of the wide variety of new mammals that this private army of collectors discovered. The effect on the collections and on his output of published work was dramatic: the sudden upsurge in accessions in the years 1891–1910 is reflected in the 555 papers that he published during this period (Tables 1, 2).

In all, Thomas was responsible for some 1090 items of published work, including a small number of letters to newspapers and magazines but otherwise without exception concerned with professional topics and usually with the descriptions of new mammals. He proposed some 2900 new names for genera, species and subspecies and is without doubt the most prolific of all mammalogists. While it can be said that most of his papers are short, by the standards of the time they are terse, effective accounts unburdened by superfluous detail. He might well have written more, but in the context of the numbers of specimens that passed through his hands (Table 1) nothing can belittle his achievement in describing and naming the vast undiscovered faunas that his collectors revealed. His practical mind and prodigious memory enabled him to come very quickly to the essentials of mammalian systematics as reflected by the steadily increasing collections, and he worked rapidly, moving unhesitatingly from one topic to another. This became his occupation for the remainder of his career: in carrying it out he so augmented his beloved National Collection to the extent that it remains one of the leading collections in the world in variety and numbers of specimens, and especially in its content of original material, reflecting the vast number of new taxa that he and his helpers described during this period.

Despite this new and absorbing interest, Thomas did not entirely desert the cataloguing of the collections. In 1904 he persuaded and at least in part financed a young Danish zoologist, Knud Andersen to come to London and prepare a monographic catalogue of the Chiroptera. This decision proved wise and apart from a succession of shorter papers incidental to the work the first volume on the Megachiroptera appeared in 1912. The preparation of a second volume on the Microchiroptera was cut short by the sudden and hitherto unexplained disappearance of Andersen in 1918.[1] Similarly Thomas encouraged his friend and colleague G. S. Miller to prepare a catalogue of the mammals of western Europe which was published in 1912.

No memoir of Thomas can omit his part with R. C. Wroughton and W. S. Millard in setting up the Bombay Natural History Society's Mammal Survey of the Indian subcontinent in the early part of this century. The application of Thomas' by then well-tested methods of engaging and financing collectors soon resulted in the arrival of huge packing cases of specimens at the British Museum (Natural History), all to be unpacked and their contents laid out for study by Thomas and by members of the band of unofficial workers (Appendix 1) that he had gathered together. The magnitude of the collections obtained by the Survey is known only too well to the present writer, who soon after appointment to the staff of the Museum in 1948 was responsible for re-packing most of the material for return to India: the many publications resulting from this accumulation remain a basic source and a tribute to the foresight of Thomas and Wroughton.

Thomas had a formidable grasp of nomenclature and its niceties, realising early in his

[1] Andersen disappeared without warning or any public explanation, giving rise to much speculation at the time, even that he might have been a secret agent. The truth is more prosaic: a letter from Andersen found in 1949 among some of Thomas' effects explained that Andersen's domestic circumstances had become so intolerable that he had resolved to end a situation that he could no longer endure. Nothing further was ever heard of him.

career that basic stability could be obtained only by attaching the many names that abounded in the nineteenth century literature to the original specimens that by then had found their way into the collections at South Kensington. With this in mind he designated lectotypes from many of the collections on which earlier naturalists had based their observations and descriptions. Possibly his most spectacular achievement in so doing was to recognise among the many specimens from the Lidth de Jeude collection that the Museum had purchased in 1867 were some that had been formerly the property of Albert Seba. Figured in his 'Thesaurus' of 1734, many were in fact the types of names proposed subsequently by Linnaeus and based on Seba's illustrations (010[9]).

Ever practical, he produced one of the first attempts to standardize basic skull measurements and tooth nomenclature (0486) and devised a simple instrument for measuring the incisive index in rodents (0862). Realising that his collectors would benefit from clear instructions, he wrote a leaflet giving directions for the preparation of small mammal skins (0147) but was forced to issue it at his own expense since Dr. Gunther, the Keeper of Zoology, did not think that it would be of any use to the Museum. In one modification or another it has continued in print to the present day.

No less than two genera and thirty eight species and subspecies were named after Thomas (Appendix 2), an indication of the esteem in which he was held by his colleagues. Such dedications are sometimes accompanied by tributes that acknowledge the generous help that he provided to others. It is equally apparent from the numerous unofficial workers and volunteers that Thomas encouraged to work in the Mammal Room that he was able to inspire others with his vision of a great National Collection, served by a willing band of helpers.

His own names (Index) explore almost every basis for a scientific epithet. Many commemorate his sponsors, collectors, friends and relatives, or are geographical in origin. Others are classical, Thomas having dredged deeply among the mythology of the Ancient Greeks and Romans. Yet more are derived directly from Greek and Latin, impeccably constructed and usually descriptive. Not lacking humour, he proposed *Ia io* (a bat, 0377) reputedly in response to a challenge from G. S. Miller to coin the shortest name in mammalogy. Occasionally his enthusiasm ran away with him and he proposed one new name (*Talpa milleri*, a mole, 0665) that remained still-born: it reached the page proofs of the *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London, but was then withdrawn. Another such name (*Cervus spatulatus*, a deer) escaped: based on a set of much deformed antlers from Borneo, it similarly reached the page proofs of the *Proceedings of the Zoological Society of London* (0330), at which point Thomas decided to abort it. Unfortunately, he had overlooked its publication in the *Minutes of the Proceedings* (0329) of the meeting at which he had exhibited the specimen, and the name remains available in the literature, although undiscovered.

Obviously, much of Thomas' classification has been superseded in the sixty years since his death. Indeed, many of the names that he proposed have been reduced in rank or have passed into synonymy, some the victims of his own methods as the increasing numbers of specimens in collections have led to a wider understanding of population structure and variation. It is true, too, that late in life his use of the terms species and subspecies became erratic. His vast output of new names has led some to regard him as a mere museum systematist with little understanding of natural history, or even as one to whom the description of new taxa had become an overwhelming obsession, however flimsily these proposals might be based.

None of this, however, can detract from an achievement that can only be described as monumental. The Mammal Section of the British Museum (Natural History) contains many reminders of Oldfield Thomas, from his portraits (Pls. 1, 2) to his crabbed handwriting (Pl. 4) scattered throughout catalogues, the Accession Registers, on the

labels of innumerable specimens, and as annotations in the margins and text of his own publications. No worker in this collection can fail to see and wonder at the results of the undertaking to which Thomas set his hand and which he carried forward with such single-minded determination. He created a foundation for his successors to build upon, a tradition that they have followed, and was truly a pioneer and founding father of modern systematic mammalogy.

Table 1 Accessions of specimens of mammals to the British Museum (Natural History), 1837 – 1988, excluding Cetacea, domestic animals, and skeletal material.

1837 – 1840	647	1911 – 1920	25137
1841 – 1850	6802	1921 – 1930	21699
1851 – 1860	4614	1931 – 1940	19826
1861 – 1870	3135	1941 – 1950	8098
1871 – 1880	3642	1951 – 1960	12065
1881 – 1890	4341	1961 – 1970	26673
1891 – 1900	13277	1971 – 1980	27731
1901 – 1910	33458	1981 – 1988	16987

Following the custom of his time, Thomas made many imperfect or apparently superfluous specimens into 'duplicates' Some were donated to other institutions, but the greater part of this so-called duplicate collection was retained, and eventually accessed and incorporated into the study collections, chiefly in 1965 and 1966, by which time it also included a number of specimens added since Thomas' day.

Table 2 Totals of publications by Oldfield Thomas: two items (0330, 0665) that he carried to proof stage and subsequently withdrew have been omitted. There is a close relation with the volume of accessions to the collections (Table 1) during his working life.

1879 – 1880	7
1881 – 1890	81
1891 – 1900	220
1901 – 1910	335
1911 – 1920	247
1921 – 1929	200

Plate 1 A portrait of Oldfield Thomas, F. R. S., by J. E. Braun, dated 1904, bequeathed by Thomas to the British Museum (Natural History).

Plate 2 A portrait of Oldfield Thomas, F. R. S., artist and date unknown, bequeathed by Thomas to the British Museum (Natural History).

Plate 3 Commemorative plaque in the lift in the Main Hall of the British Musem (Natural History).

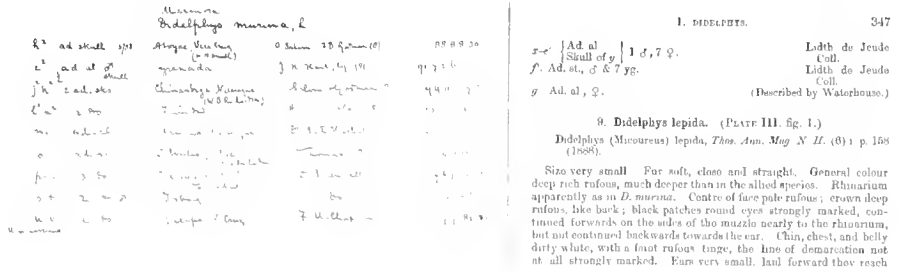


Plate 4 Oldfield Thomas' handwriting: a sample taken from an interleaved copy of his Catalogue of the Marsupialia and Monotremata (0065, 1888) which he amended as further specimens were added to the collection.

BIBLIOGRAPHY

The order of listing of references within the year in this bibliography does not imply any priority of publication and no publication dates beyond the year have been established except where these are relevant to instances of multiple description. Titles in square brackets have been compiled to indicate the content of articles lacking any formal heading.

Thomas published the greater part of his work in the *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London, and in the *Proceedings of the Zoological Society of London*, the latter consisting in part of the amplified formal versions of papers initially delivered verbally at the regular Scientific Meetings of the Society. As a rule, both journals present little difficulty for the bibliographer. The volumes of the *Annals* have been presumed here to have appeared in the year to which they refer: the dates of issue of the parts of the *Proceedings* can be obtained from Martin Duncan (1937).

However, a brief account of announcements, specimens exhibited, and papers presented was issued shortly after each of the Scientific Meetings of the Zoological Society, from 1867 to 1904 as the 'Minutes of the Proceedings of the Zoological Society of London' and from 1904 to 1936 in a more formal style and titled 'Abstracts' rather than 'Minutes'. These antedate the corresponding parts of the Proceedings, sometimes by many months, or even appearing in the previous year, and often contain newly

proposed names. Some of these are *nomina nuda* and of no nomenclatural consequence but many seem quite validly proposed: although certainly in the 'Minutes' each account is a summary of the describer's remarks by another hand, it is clearly ascribed to the originator. Where any of Thomas' names have first appeared in this way, with a description, the relevant reference has been treated as a formal paper and included as such in his bibliography. Where the entry in the 'Minutes' or 'Abstracts' relates only to a report of specimens exhibited but not formally named, or mentioned with a *nomen nudum*, the reference has been listed separately in a terminal supplement, its serial number prefixed 'A'.

Evidently Thomas was instrumental in changing the rather informal 'Minutes' into a more obviously accredited publication. A printed version of a letter (0309) that he wrote in 1901 to P. L. Sclater, then the Secretary of the Zoological Society survives in his collected works and was apparently circulated as a broadsheet. In this Thomas suggested that henceforward the publication should be called the Abstracts of the Proceedings; it should be continuously paginated; sufficient should be printed to satisfy foreign libraries and museums; it should be issued to all Fellows of the Society; new species should date from the Abstracts, for which authors should prepare their own accounts; and that these submissions must be an abstract of a paper already with the Society. Most if not all of these proposals seem to have been adopted, and the 'Minutes' terminated on 13 December, 1904: meanwhile the 'Abstracts' began on 13 January of the same year, being issued on the Tuesday following the Meeting to which each referred, and also being placed on sale at the Society's Offices.

1879

0001 On Robert Kerr's translation of the 'Systema Naturae' of Linnaeus. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (5) **4**: 397.

1880

0002 Description of a new species of *Mus* from the Fiji Islands. *Proceedings of the Zoological Society of London* 11–13, 1 fig.

0003 On the *Myoxus elegans* of Temminck. *Proceedings of the Zoological Society of London* 40–41.

0004 On mammals from Ecuador. *Proceedings of the Zoological Society of London* 393–403, figs 1–3, pl. 38.

0005 Description of a new bat from Java, of the genus *Kerivoula*. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (5) **5**: 472–473, 1 fig.

0006 On bats from Old Calabar. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (5) **6**: 164–167, 2 figs.

0007 Description of a new species of *Arvicola* from northern India. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (5) **6**: 332–333.

1881

0008 Description of a new species of *Reithrodon*, with remarks on the other species of the genus. *Proceedings of the Zoological Society of London* (1880): 691–696, figs. 1–4.

0009 Account of the zoological collections made during the survey of H.M.S. 'Alert' in the Straits of Magellan and on the coast of Patagonia. *Proceedings of the Zoological Society of London* 3–6, figs. 1–2.

0010 Description of a new species of *Mus* from southern India. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (5) **7**: 24.

0011 On the Indian species of the genus *Mus*. *Proceedings of the Zoological Society of London* 521–557, pls. 50–51.

0012 Description of a new species of mole from China. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (5) **7**: 469–471.

0013 Description of a new species of *Alactaga* from Mesopotamia. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (5) **8**: 15–16.

1882

0014 On the African mungooses. *Proceedings of the Zoological Society of London* 59–93, fig. 1, pl. 3.

0015 On a collection of rodents from north Peru. *Proceedings of the Zoological Society of London* 98–111, pl. 4.

0016 On a small collection of rodents from South-Western Africa. *Proceedings of the Zoological Society of London* 265–267, pl. 14.

0017 Description of a new genus and two new species of Insectivora from Madagascar. *Journal of the Linnean Society of London* **16**: 319–322, 1 fig.

0018 On a small collection of Mammalia from central Mexico. *Proceedings of the Zoological Society of London* 371–372.

0019 On two new Muridae from Tasmania. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (5) **9**: 413–416, figs. 1–4.

0020 Description of a new species of rat from China. *Proceedings of the Zoological Society of London* 587–588, pl. 44.

1883

0021 Description of two new species of *Pteropus* from the Caroline Islands. *Proceedings of the Zoological Society of London* (1882): 755–757, pls. 54–55.

0022 On *Mustela albinucha*, Gray. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (5) **11**: 370–371, 1 fig.

1884

0023 On a collection of Muridae from central Peru. *Proceedings of the Zoological Society of London* 447–458, pls. 42–44.

0024 Description of a new species of *Microgale*. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (5) **14**: 337–338.

0025 *Report on the zoological collections made in the Indo-Pacific Ocean during the voyage of H.M.S. Alert 1881–2. Part I. The collections from Melanesia. Mammalia.* Pp. 5–10. London: Trustees of the British Museum (Natural History).

1885

0026 Report on the mammals obtained and observed by Mr. H. H. Johnston on Mount Kilimanjaro. *Proceedings of the Zoological Society of London* 219–222, pl. 12.

0027 Notes on the characters of the different races of *Echidna*. *Proceedings of the Zoological Society of London* 329–339, pls. 23–24.

0028 Account of a collection of human skulls from Torres Straits. *Journal of the Anthropological Institute of Great Britain and Ireland* **14**: 328–343, pls. 14–15, tabs. 1–3.

0029 [Remarks on a burrowing rodent, *Heterocephalus phillipsi*, n. sp.]. *Proceedings of the Zoological Society of London* 611–612.

1886

0030 Notes on the rodent genus *Heterocephalus*. *Proceedings of the Zoological Society of London* (1885): 845–849, pl. 54, [figs. 1–5].

0031 Diagnoses of three new Oriental mammals. *Annals and Magazine of Natural History; including Zoology, Botany and Geology, London* (5) **17**: 84.

0032 On the mammals presented by Allan O. Hume, Esq., C.B., to the Natural History Museum. *Proceedings of the Zoological Society of London* 54–79, pls. 5–6.

0033 Description of a new Brazilian species of *Hesperomys*. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (5) **17**: 250–251.

0034 Notes on a striking instance of cranial variation due to age. *Proceedings of the Zoological Society of London* 125–127, 1 pl.

0035 Diagnosis of a new species of *Phascologale*. *Annali del Museo Civico di Storia Naturale di Genova* (2a), (O.S. 24) **4**: 208.

0036 Note intorno ad alcuni Chirotteri appartenenti al Museo Civico di Genova e descrizione di due nuove specie del genere *Phyllorhina*. *Annali del Museo Civico di Storia Naturale di Genova* (2a), (O.S. 24) **4**: 201–207, 1 fig. [With G. Doria].

1887

0037 On the wallaby commonly known as *Lagorchestes fasciatus*. *Proceedings of the Zoological Society of London* (1886): 544–547, pl. 59.

0038 Note on *Hesperomys pyrrhorhinus*, Pr. Max. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (5) **18**: 421–423.

0039 Diagnosis of a new species of *Hesperomys* from North America. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (5) **19**: 66.

0040 Description of a new Papuan phalanger. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (5) **19**: 146–147.

0041 Diagnoses of two new fruit-eating bats from the Solomon Islands. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (5) **19**: 147.

0042 List of mammals from the Cameroons Mountain, collected by Mr. H. H. Johnston. *Proceedings of the Zoological Society of London* 121.

0043 On the small Mammalia collected in Demerara by Mr. W. L. Sclater. *Proceedings of the Zoological Society of London* 150–153, pl. 19.

0044 On the bats collected by Mr. C. M. Woodford in the Solomon Islands. *Proceedings of the Zoological Society of London* 320–328, figs. 1–3, pls. 25–26.

0045 On the milk-dentition of the koala. *Proceedings of the Zoological Society of London* 338–339, 1 fig.

0046 On the homologies and succession of the teeth in the Dasyuridae, with an attempt to trace the history of the evolution of mammalian teeth in general. *Proceedings of the Royal Society of London* **42**: 310–312. [Abstract].

0047 On the homologies and succession of the teeth in the Dasyuridae, with an attempt to trace the history of the evolution of mammalian teeth in general. *Philosophical Transactions of the Royal Society of London* (B) **178**: 443–462, figs. 1–5, pls. 27–28.

0048 On the specimens of *Phascogale* in the Museo Civico, Genoa, with notes on the allied species of the genus. *Annali del Museo Civico di Storia Naturale di Genova* (2a), (O.S. 24) **4**: 502–511.

0049 Description of a second species of rabbit-bandicoot (*Peragale*). *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (5) **19**: 397–399.

0050 Report on a zoological collection made by the officers of H.M.S. 'Flying Fish' at Christmas Island, Indian Ocean. *Proceedings of the Zoological Society of London* 511–514, pls. 41–42.

0051 Description of two new squirrels from North Borneo. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (5) **20**: 127–129.

0052 Description of a new rat from North Borneo. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (5) **20**: 269–270.

0053 Diagnoses of two new central African Mammalia. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (5) **20**: 440.

1888

0054 On a collection of mammals obtained by Emin Pasha in equatorial Africa, and presented by him to the Natural History Museum. *Proceedings of the Zoological Society of London* 3–17, pls. 1–2.

0055 List of mammals obtained by Mr. G. F. Gaumer on Cozumel and Ruatan Islands, Gulf of Honduras. *Proceedings of the Zoological Society of London* 129.

0056 Diagnoses of six new mammals from the Solomon Islands. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (6) **1**: 155–158.

0057 Diagnoses of four new species of *Didelphys*. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (6) **1**: 158–159.

0058 On a new and interesting annectant genus of Muridae, with remarks on the relations of the Old and New World members of the family. *Proceedings of the Zoological Society of London* 130–135, pl. 5.

0059 Description of a new genus and species of rat from New Guinea. *Proceedings of the Zoological Society of London* 237–240, 2 figs.

0060 On *Eupetaurus*, a new form of flying squirrel from Kashmir. *Journal of the Asiatic Society of Bengal*, Calcutta **57**: 256–260.

0061 Description of a new bat of the genus *Nyctophilus*. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (6) **2**: 226.
0062 On a new species of *Loncheres* from British Guiana. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (6) **2**: 326
0063 Diagnoses of four new mammals from the Malayan region. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (6) **2**: 407–409.
0064 On the small mammals of Duval County, south Texas. *Proceedings of the Zoological Society of London* 443–450.
0065 *Catalogue of the Marsupialia and Monotremata in the collection of the British Museum (Natural History)*. London: Trustees of the British Museum (Natural History).

1889

0066 The mammals of the Solomon Islands, based on the collections made by Mr. C. M. Woodford during his second expedition to the Archipelago. *Proceedings of the Zoological Society of London* (1888): 470–484, pls. 20–22.
0067 On the mammals of Christmas Island. *Proceedings of the Zoological Society of London* (1888): 532–534.
0068 Exhibition of a new species of muntjac, from Tenasserim, proposed to be called *Cervulus feae*. *Proceedings of the Zoological Society of London* 85. [1 August 1889].
0069 Diagnosi di una nuova specie del genero *Cervulus* raccolta da L. Fea nel Tenasserim. *Annali del Museo Civico di Storia Naturale di Genova* 2a, (O.S. 27) **7**: 92. [With G. Doria]. [No exact date].
0070 Description of a new Bornean monkey belonging to the genus *Semnopithecus*. *Proceedings of the Zoological Society of London* 159–160, pl. 16.
0071 Description of a new bat from the Gambia. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (6) **3**: 362–364, 1 fig.
0072 Preliminary notes on the character and synonymy of the different species of otter. *Proceedings of the Zoological Society of London* 190–200.
0073 On the mammals of Mount Kina Balu, North Borneo. *Proceedings of the Zoological Society of London* 228–236, pl. 24.
0074 Description of a new species of *Mus*, from South Australia. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (6) **3**: 433–435, 1 fig.
0075 Description of a new genus of Muridae allied to *Hydromys*. *Proceedings of the Zoological Society of London* 247–250, pl. 29.
0076 On the dentition of *Ornithorhynchus*. *Proceedings of the Royal Society of London* **46**: 126–131, pl. 2.
0077 Description of a new stenodermatous bat from Trinidad. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (6) **4**: 167–170, 3 figs.
0078 The zoology of the Afghan Delimitation Commission. Mammals. *Transactions of the Linnean Society of London* (2) Series Zoology **5**: 55–65.
0079 Note on the nomenclature of the short-eared New-Zealand bat. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (6) **4**: 462.

1890

0080 On a new mungoose allied to *Herpestes albicaudatus*. *Proceedings of the Zoological Society of London* (1889): 622–624, pl. 62.
0081 "A milk dentition in *Orycteropus*". *Proceedings of the Royal Society of London* **47**: 246–248, pl. 8.
0082 On a collection of mammals from central Veracruz, Mexico. *Proceedings of the Zoological Society of London* 71–76, pls. 6–7.
0083 Description of a new *Scotophilus* from the Gambia, with remarks on some of the allied species. *Annali del Museo Civico di Storia Naturale di Genova* (2a), (O.S. 29) **9**: 84–88.
0084 Diagnosis of a new *Cynopterus* from Borneo. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (6) **5**: 235–236.
0085 On a collection of mammals obtained by Dr. Emin Pasha in central and eastern Africa. *Proceedings of the Zoological Society of London* 443–450, 1 fig., pl. 40.

0086 Description of a new squirrel from Borneo. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (6) **6**: 71–72.

0087 Remarks on Dr. Schlosser's "Ueber die Deutung des Milchgebisses der Säugetiere". *Biologisches Zentralblatt*, Erlangen & Leipzig **10**: 216–219.

0088 Muridae. In Milne-Edwards, A., *Mission scientifique du Cap Horn 1882–1883*. **6**. Zoologie. Mammifères 1–32, pls. 1–8 [pp. 22–30, pls. 2–6, 8].

1891

0089 Preliminary diagnoses of four new mammals from East Africa. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (6) **7**: 303–304.

0090 Note on *Chiroderma villosum* Peters, with the description of a new species of the genus. *Annali del Museo Civico di Storia Naturale di Genova* (2a), (O.S. 30) **10**: 881–883.

0091 Diagnoses of three new mammals collected by Signor L. Fea in the Carin Hills, Burma. *Annali del Museo Civico di Storia Naturale di Genova* (2a), (O.S. 30) **10**: 884.

0092 On a collection of small mammals made by Mr. F. J. Jackson in eastern Africa. *Proceedings of the Zoological Society of London* 181–187, 1 fig., pl. 15.

0093 On some antelopes collected in Somali-land by Mr. T. W. H. Clarke. *Proceedings of the Zoological Society of London* 206–212, pls. 21–22.

0094 Descriptions of three new bats in the British Museum collection. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (6) **7**: 527–530, 1 fig.

0095 Notes on some ungulate mammals. *Proceedings of the Zoological Society of London* 384–389.

0096 Description of a new vole from China. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (6) **8**: 117–118, 1 fig.

0097 Diagnosis of a new species of *Procavia*. *Annali del Museo Civico di Storia Naturale di Genova* (2a), (O.S. 30) **10**: 908.

1892

0098 Descriptions of three new gerbilles in the British Museum collection. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (6) **9**: 76–79.

0099 On the species of the Hyracoidea. *Proceedings of the Zoological Society of London* 50–76, pl. 3.

0100 Note on the gibbon of the island of Hainan (*Hylobates hainanus* sp. n.). *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (6) **9**: 145–146.

0101 Diagnosis of a new subspecies of hare from the Corea. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (6) **9**: 146–147.

0102 Description of a new species of *Meriones* from Palestine. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (6) **9**: 147–149.

0103 On some new Mammalia from the East Indian Archipelago. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (6) **9**: 250–254.

0104 Exhibition of, and remarks upon, a mounted head of an apparently new East-African antelope (*Oryx callotis*). *Proceedings of the Zoological Society of London* 195–196, pl. 14.

0105 On some mammals from Mount Dulit, North Borneo. *Proceedings of the Zoological Society of London* 221–227, pls. 18, 19 [figs. 1–6].

0106 Notes on Dr. Kukenthal's discoveries in mammalian dentition. *Annals and Magazine of Natural History, including Zoology, Botany and Geology*, London (6) **9**: 308–313.

0107 On two new Central-African antelopes obtained by Mr. F. J. Jackson. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (6) **9**: 385–388.

0108 Description of a third species of the genus *Nyctophilus*. *Annals and Magazine of Natural History, including Zoology, Botany and Geology*, London (6) **9**: 405–406.

0109 On the probable identity of certain specimens, formerly in the Lidth de Jeude Collection, and now in the British Museum, with those figured by Albert Seba in his 'Thesaurus' of 1734. *Proceedings of the Zoological Society of London* 309–318.

0110 On the antelopes of the genus *Cephalophus*. *Proceedings of the Zoological Society of London* 413–430.

0111 On the insectivorous genus *Echinops*, Martin, with notes on the dentition of the allied genera. *Proceedings of the Zoological Society of London* 500–505.
0112 Description of a new species of *Acomys*. *Annals and Magazines of Natural History; including Zoology, Botany and Geology*, London (6) **10**: 22.
0113 Descriptions of three new African Muridae. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (6) **10**: 179–183.
0114 Diagnosis of a new Mexican *Geomys*. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (6) **10**: 196.
0115 Descriptions of two new Bornean squirrels. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (6) **10**: 214–216.
0116 Note on the *Steatomys* of Angola. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (6) **10**: 264–265.
0117 Description of a new bat of the genus *Artibeus* from Trinidad. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (6) **10**: 408–410.
0118 Note on Mexican examples of *Chilonycteris davyi* Gray. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (6) **10**: 410.
0119 Description of a remarkable new *Semnopithecus* from Sarawak. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (6) **10**: 474–477.
0120 Description of a new Mexican bat. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (6) **10**: 477–478.
0121 On the Mammalia collected by Signor Leonardo Fea in Burma and Tenasserim. *Annali del Museo Civico di Storia Naturale di Genova* (2a), (O.S. 30) **10**: 913–949, pls. 10, 11 [figs. 1–7].

1893

0122 On mammals from Nyassaland. *Proceedings of the Zoological Society of London* (1892): 546–554.
0123 Description of a new monkey of the genus *Semnopithecus* from northern Borneo. *Proceedings of the Zoological Society of London* (1892): 582–583, pl. 41.
0124 Description of a new baboon from East Africa. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (6) **11**: 46–47.
0125 On a new *Cephalophus* from Mount Kilima-njaro. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (6) **11**: 48–49.
0126 On the Mexican representative of *Sciurus aberti*. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (6) **11**: 49–50.
0127 Description of a new species of *Sminthus* from Kashmir. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (6) **11**: 184–186.
0128 Further notes on the genus *Chiroderma*. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London, (6) **11**: 186–187.
0129 Description of a new porcupine from East Africa. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (6) **11**: 229–231.
0130 Exhibition of, and remarks upon, a specimen of *Nannotragus livingstonianus* from northern Zululand. *Proceedings of the Zoological Society of London* 237–239, 1 fig.
0131 Suggestions for the definite use of the word "Type" and its compounds, as denoting specimens of a greater or less degree of authenticity. *Proceedings of the Zoological Society of London* 241–242.
0132 A fish-eating rodent. *Natural Science*, London **2** (14): 286. [April 1893: British Museum (Natural History) copy stamped 29 March].
0133 Description of two new "pocket-mice" of the genus *Heteromys*. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (6) **11**: 329–332.
0134 On some mammals from central Peru. *Proceedings of the Zoological Society of London* 333–341, pls. 28, 29 [figs. 1–10]. [August 1893].
0135 A preliminary list of the mammals of Trinidad. *Journal of the Trinidad Field Naturalists' Club*, Port of Spain **1**: 158–168.
0136 On a second collection of mammals sent by Mr. H. H. Johnston, C.B., from Nyasaland. *Proceedings of the Zoological Society of London* 500–504.
0137 On some new Bornean Mammalia. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (6) **11**: 341–347.

0138 Notes on some Mexican *Oryzomys*. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (6) **11**: 402–405.
0139 Description of a new species of *Perognathus* from Colorado. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (6) **11**: 405–406.
0140 Description of a new *Sciuropterus* from the Philippines. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (6) **12**: 30–31.
0141 Description of a new Bornean *Tupaia*. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (6) **12**: 53–54.
0142 Description of a second species of the carnivorous genus *Nandinia*, from southern Nyasaland. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (6) **12**: 205.
0143 Descriptions of two new North-Bornean mammals. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (6) **12**: 230–232, pl. 7.
0144 On two new members of the genus *Heteromys* and two of *Neotoma*. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (6) **12**: 233–235.
0145 Descriptions of two new rodents from the Victoria Nyanza. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (6) **12**: 267–269.
0146 On some of the larger species of *Geomys*. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (6) **12**: 269–273.

1894

0147 Directions for preparing small mammal skins. [With a manuscript note by Oldfield Thomas "The first edition of the directions – printed privately as Dr. Gunther [then the Keeper of Zoology] did not think that any such issue would be of use to the Museum"].
0148 Descriptions of two new species of *Macroscelides*. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (6) **13**: 67–70.
0149 On a new species of armadillo from Bolivia. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (6) **13**: 70–72.
0150 Description of a new species of reed-rat (*Aulacodus*) from East Africa, with remarks on the milk-dentition of the genus. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (6) **13**: 202–204.
0151 Note on *Mus burtoni* Thomas. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (6) **13**: 204–205.
0152 Description of a new bat of the genus *Stenoderma* from Montserrat. *Proceedings of the Zoological Society of London* 132–133.
0153 Exhibition of, and remarks upon, a skin of a giraffe from Somaliland. *Proceedings of the Zoological Society of London* 135–136.
0154 On the mammals of Nyasaland: third contribution. *Proceedings of the Zoological Society of London* 136–146.
0155 Diagnosis of a new *Pteropus* from the Admiralty Islands. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (6) **13**: 293.
0156 On two new Chinese rodents. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (6) **13**: 363–365.
0157 Preliminary description of a new goat of the genus *Hemitragus*, from south-eastern Arabia. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (6) **13**: 365–366.
0158 On the Palawan representative of *Tupaia ferruginea*. *Annals and Magazine of Natural History, including Zoology, Botany and Geology*, London (6) **13**: 367.
0159 On the dwarf antelopes of the genus *Madoqua*. *Proceedings of the Zoological Society of London* 323–329, figs. 1–3.
0160 On some mammals from Engano Island, west of Sumatra. *Annali del Museo Civico di Storia Naturale di Genova* (2a), (O.S. 34) **14**: 105–110.
0161 On two new Neotropical mammals. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (6) **13**: 436–439.
0162 Preliminary diagnosis of a new gazelle from Algeria. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (6) **13**: 452.

0163 On some specimens of mammals from Oman, S.E. Arabia. *Proceedings of the Zoological Society of London* 448–455, pl. 31.
0164 On a new African genus of Mustelidae. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (6) **13**: 522–524.
0165 On some gazelles brought by Sir Edmund Loder from Algeria. *Proceedings of the Zoological Society of London* 467–472, pl. 32.
0166 On *Micoureus griseus* Desm., with the description of a new genus and species of Didelphyidae. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (6) **14**: 184–188.
0167 First glimpses of the zoology of the Natuna Islands. III. List of the first collection of mammals from the Natuna Islands. *Novitates Zoologicae* **1**: 652–660. [With E. Hartert].
0168 Description of a new species of *Vespertilio* from China. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (6) **14**: 300–301.
0169 Descriptions of some new Neotropical Muridae. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (6) **14**: 345–366.
0170 A preliminary revision of the Bornean species of the genus *Mus*. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (6) **14**: 449–460.
0171 Description of two new bats of the genus *Kerivoula*. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (6) **14**: 460–462.
0172 *The book of antelopes*. London: R. H. Porter. [With P. L. Sclater: 4 vols., published 1894–1901].

1895

0173 On the brush-tailed porcupine of central Africa. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (6) **15**: 88–89.
0174 On some mammals collected by Dr. E. Modigliani in Sipora, Mentawei Islands. *Annali del Museo Civico di Storia Naturale di Genova* (2a), (O.S. 34) **14**: 660–672.
0175 On the proper specific names of the common shrews of England and the Continent. *Zoologist*, London (3) **19**: 62–64.
0176 Diagnoses of two new East-African mammals. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (6) **15**: 187–188.
0177 An analysis of the mammalian generic names given in Dr. C. W. L. Gloger's Naturgeschichte (1841). *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (6) **15**: 189–193.
0178 On the long-lost *Putorious africanus* Desm., and its occurrence in Malta. *Proceedings of the Zoological Society of London* 128–131.
0179 Revised determinations of three of the Natuna rodents. *Novitates Zoologicae* **2**. 26–28.
0180 Yellow-tailed squirrels. *Zoologist*, London (3) **19**: 103–104.
0181 Esplorazione del Giuba e dei suoi Affluenti compiuta dal Cap. V. Bottego durante gli anni 1892–93 gotto gli auspicii della Societa Geographica Italiana. – Risultati Zoologici. 1. Mammiferi. *Annali del Museo Civico di Storia Naturale di Genova* (2a), (O.S. 35) **15**: 3–6.
0182 The Irish stoat distinct from the British. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (6) **15**: 374. [With G. E. H. Barrett-Hamilton]. [April: "A fuller account . . . will appear in the 'Zoologist' for April"].
0183 The Irish stoat distinct from the British Species. *Zoologist*, London (3) **19**: 124–129. [With G. E. H. Barrett-Hamilton]. [April].
0184 Description of a new species of *Helictis* from Borneo. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (6) **15**: 331–332.
0185 On the proper specific name of the weasel. *Zoologist*, London (3) **19**: 177–178.
0186 The proper specific name of the weasel. *Zoologist*, London (3) **19**: 225–226.
0187 The Irish stoat in the Isle of Man. *Zoologist*, London (3) **19**: 226–227.
0188 On the representatives of *Putorius ermineus* in Algeria and Ferghana. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (6) **15**: 451–454.
0189 [The Pacific rat (*Mus exulans*) from Sunday Island, Kermadec Group.] In Sclater, P.L., Remarks on the Pacific rat (*Mus exulans*). *Proceedings of the Zoological Society of London* 338.
0190 On a special mountain race of the plantain squirrel from Mount Dulit, E. Sarawak. *Annals*

and Magazine of Natural History; including Zoology, Botany and Geology, London (6) **15**: 529–531.

0191 On a new banded mungoose from Somaliland. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (6) **15**: 531–532.

0192 On some mammals collected by Mr. Albert Meek on Fergusson Island, d'Entrecasteaux Group. *Novitates Zoologicae* **2**: 163–166.

0193 On the mammals of Aden. *Proceedings of the Zoological Society of London* 542–555. [With J. W. Yerbury].

0194 The Assogue (*Putorius hibernicus*): a peculiar British mammal. *Natural Science*, London **6** (40): 377–378, pl. 4.

0195 Descriptions of five new African shrews. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (6) **16**: 51–55.

0196 On small mammals from Nicaragua and Bogota. *Annals and Magazine of Natural History, including Zoology, Botany and Geology*, London (6) **16**: 55–60.

0197 Preliminary diagnosis of new mammals from northern Luzon, collected by Mr. John Whitehead. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (6) **16**: 160–164.

0198 On a new species of *Eliurus*. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (6) **16**: 164–165.

0199 Description of a new Chinese squirrel. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (6) **16**: 242.

0200 On African mole-rats of the genera *Georhychus* and *Myoscalops*. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (6) **16**: 238–241.

0201 Descriptions of four small mammals from South America, including one belonging to the peculiar marsupial genus "*Hyracodon*," Tomes. *Annals and Magazine of Natural History, including Zoology, Botany and Geology*, London (6) **16**: 367–370.

0202 On a second collection of mammals from the Natuna Islands. *Novitates Zoologicae*. **2**: 489–492. [With E. Hartert].

0203 Land mammals. In The Scientific Results of the 'Challenger' Expedition. *Natural Science*, London **7** (41): 73–74.

1896

0204 On *Caenolestes*, a still existing survivor of the Epanorthidae of Ameghino, and the representative of a new family of recent marsupials. *Proceedings of the Zoological Society of London* (1895): 870–878, pl. 50 [figs. 1–9].

0205 On a wild living mouse of the *Mus musculus* group in Portugal. *Zoologist*, London (3) **20**: 137–139.

0206 On mammals from Celebes, Borneo and the Philippines recently received at the British Museum. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (6) **18**: 241–250.

0207 Description of a new *Acomys* from Somaliland. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (6) **18**: 269–270.

0208 On new small mammals from the Neotropical region. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (6) **18**: 301–314.

0209 The seasonal changes in the common squirrel. *Zoologist*, London (3) **20**: 401–407.

0210 On Capt. Bottego's second collection of mammals from central and southern Somaliland. *Annali di Museo Civico di Storia Naturale di Genova* (2a), (O.S. 37) **17**: 105–107.

0211 On mammals collected by Mr. Albert Meek on Woodlark Island, and on Kiriwina in the Trobriand Islands. *Novitates Zoologicae* **3**: 526–529.

1897

0212 On the mammals of Nyasaland: fourth notice. *Proceedings of the Zoological Society of London* (1896): 788–798, pls. 38–39.

0213 On the genera of rodents: an attempt to bring up to date the current arrangement of the order. *Proceedings of the Zoological Society* of London (1896): 1012–1028.

0214 On the Tsu-shima representative of the Japanese sable. *Annals and Magazine of Natural History, including Zoology, Botany and Geology*, London (6) **19**: 161–162.

0215 On a new gazelle from central Arabia. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (6) **19**: 162–163.

0216 On a new dormouse from Mashonaland. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (6) **19**: 388–389.

0217 On a new species of *Lagidium* from the eastern coast of Patagonia. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (6) **19**: 466–467.

0218 Notes on some South American Muridae. I. On three new species from the Lower Amazon [pp. 494–497]. II. The species of the genus *Nectomys* [pp. 497–500]. III. A peculiar genus for "*Oryzomys*" *instans* [pp. 500–501]. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (6) **19**: 494–501.

0219 [Exhibition of a selection of mammals recently collected by Mr. A. Whyte during his expedition to the Nyika Plateau and the Masuku mountains, north Nyasa.] *Minutes of the Proceedings of the Zoological Society of London* 4 May: 1. [7 May].

0220 [Account of the mammals obtained by Mr. John Whitehead during the last three years in the Philippine Islands.] *Minutes of the Proceedings of the Zoological Society of London* 15 June: 1.

0221 Exhibition of specimens and descriptions of new species of mammals from north Nyasaland, with a note on the genus *Petrodromus*. *Proceedings of the Zoological Society of London* 430–436. [October].

0222 On the number of grinding teeth possessed by the manatee. *Proceedings of the Zoological Society of London* 595–600, pl. 36 [figs. 1–5]. [With R. Lydekker].

0223 Notice of a memoir on the mammals obtained by Mr. John Whitehead in the Philippines. *Proceedings of the Zoological Society of London* 722.

0224 On some new phalangers of the genus *Pseudochirus*. *Annali di Museo Civico di Storia Naturale di Genova* (2a), (O.S. 38) **18**: 142–146.

0225 Description of a new rat from China. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (6) **20**: 113–114.

0226 On some small mammals from Salta, northern Argentina. *Annals and Magazine of Natural History: including Zoology, Botany and Geology*, London (6) **20**: 214–218.

0227 Descriptions of four new South-American mammals. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (6) **20**: 218–221.

0228 On two new rodents from Van, Kurdistan. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (6) **20**: 308–310.

0229 Types in natural history and nomenclature of rodents. *Science*, New York, (N.S.), **6**: 485–487.

0230 On some bats obtained in the Surat and Thana Districts by Mr. R. C. Wroughton. *Journal of the Bombay Natural History Society* **11**: 274–276.

0231 On the dwarf mungoose (*Helogale*) of Somaliland. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (6) **20**: 377–379.

0232 Diagnosis of a new subspecies of gazelle from British East Africa. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (6) **20**: 475.

0233 Descriptions of new bats and rodents from America. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (6) **20**: 544–553.

0234 Viaggio di Lamberto Loria nella Papuasia Orientale. XIX. On the mammals collected in British New Guinea by Dr. Lamberto Loria. *Annali di Museo Civico di Storia Naturale di Genova* (2a), (O.S. 38) **18**: 606–622, pl. 2.

0235 [Exhibition of a skin of a new skunk of the genus *Spilogale* from Sinaloa, Mexico, proposed to be termed *Spilogale pygmaea.*] *Minutes of the Proceedings of the Zoological Society of London* 30 November: 1.

0236 [Exhibition of a badger from Lower California, proposed to be termed *Taxidea taxus infusca.*] *Minutes of the Proceedings of the Zoological Society of London* 30 November: 1.

1898

0237 Note on their recently published paper on the dentition of the manatee. *Proceedings of the Zoological Society of London* (1897): 814. [With R. Lydekker].

0238 In Waite, E. R., On the habits of the Sydney bush-rat (*Mus arboricola*). With a note by Oldfield Thomas. *Proceedings of the Zoological Society of London* (1897): 857–860.

0239 Exhibition of, and remarks upon, specimens of an antelope of the genus *Cervicapra* obtained by Mr. F. V. Kirby in the Transvaal. *Proceedings of the Zoological Society of London* (1897): 894–898. [Thomas read this contribution by Kirby, and remarked upon the status of Kirby's newly proposed name *Cervicapra fulvorufula subalpina*].

0240 Exhibition and description of a specimen of a new skunk, *Spilogale pygmaea*, from Mexico. *Proceedings of the Zoological Society of London* (1897): 898–899.

0241 Exhibition and description of a specimen of a new badger, *Taxidea taxus infusca*, from Lower California. *Proceedings of the Zoological Society of London* (1897): 899.

0242 On the mammals obtained by Mr. A. Whyte in Nyasaland, and presented to the British Museum by Sir H. H. Johnston, K.C.B.; being a fifth contribution to the mammal-fauna of Nyasaland. *Proceedings of the Zoological Society of London* (1897): 925–939, pl.54.

0243 On new mammals from western Mexico and Lower California. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (7) **1**: 40–46.

0244 On indigenous Muridae in the West Indies: with the description of a new Mexican *Oryzomys*. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (7) **1**: 176–180.

0245 [Exhibition of the skull of a giraffe from the Niger region.] *Minutes of the Proceedings of the Zoological Society of London* 1 February: 1.

0246 Exhibition of, and remarks upon, the skull of a supposed new subspecies of giraffe from West Africa, proposed to be named *Giraffa camelopardalis peralta*. *Proceedings of the Zoological Society of London* 39–41.

0247 On the mammals collected during Captain Bottego's last expedition to Lake Rudolf and the Upper Sobat. *Annali di Museo Civico di Storia Naturale di Genova* (2a), (O.S. 38) **18**: 676–679.

0248 Description of a new bat from North Borneo. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (7) **1**: 243.

0249 Description of a new *Echimys* from the neighbourhood of Bogota. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (7) **1**: 243–245.

0250 Descriptions of three new mammals from East Indian Archipelago and Australia. *Novitates Zoologicae*, London 5: 1–4.

0251 The technical names of British mammals. *Zoologist*, London (4) **2**: 97–103.

0252 On some mammals obtained by the late Mr. Henry Durnford in Chubut, E. Patagonia. *Proceedings of the Zoological Society of London* 210–212.

0253 On some new mammals from the neighbourhood of Mount Sahama, Bolivia. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (7) **1**: 277–283.

0254 Descriptions of two new Argentine rodents. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (7) **1**: 283–286.

0255 Exhibition of, and remarks upon, a series of a Siamese squirrel showing variability in coloration. *Proceedings of the Zoological Society of London* 245–246.

0256 [Description of a new dik-dik allied to *Madoqua kirkii.*] *Minutes of the Proceedings of the Zoological Society of London* 5 April: 1.

0257 Description of a new dik-dik antelope (*Madoqua*) discovered in N.E. Africa by Mr. H. S. H. Cavendish. *Proceedings of the Zoological Society of London* 278–279.

0258 Viaggio del Dott. A. Borelli nel Chaco Boliviano e nella Republica Argentina. XII. On the small mammals collected by Dr. Borelli in Bolivia and northern Argentina. *Bollettino dei Musei di Zoologia ed Anatomia Comparata della R. Univerista di Torino* **13** (315): 1–4.

0259 Description of a new bat from Selangore. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (7) **1**: 360–362.

0260 On a small collection of mammals obtained by Mr. Alfred Sharpe, C.B., in Nyasaland. *Proceedings of the Zoological Society of London* 391–394.

0261 Viaggio di Lamberto Loria nella Papuasia Orientale. XX. Descriptions of two new cuscuses (*Phalanger*) obtained by Dr. Loria in British New Guinea. *Annali di Museo Civico di Storia Naturale di Genova* (2a), (O.S. 39) **19**: 5–8.

0262 On seven new small mammals from Ecuador and Venezuela. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (7) **1**: 451–457.

0263 On the mammals obtained by Mr. John Whitehead during his recent expedition to the

Philippines. With field notes by the collector. *Transactions of the Zoological Society of London* **14**: 377–412, pls. 30–36.

0264 Descriptions of two new cuscuses (*Phalanger*). *Novitates Zoologicae*, **5**: 433–434.

0265 Descriptions of new Bornean and Sumatran mammals. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (7) **2**: 245–251.

0266 Descriptions of new mammals from South America. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (7) **2**: 265–275.

0267 On the Zululand form of Livingstone's antelope. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (7) **2**: 317.

0268 Notes on various American mammals. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (7) **2**: 318–320.

0269 The scientific names of the badger and the common vole. *Zoologist*, London (4) **2**: 263–264

1899

0270 On mammals collected by Mr. J. D. La Touche at Kuatun, N.W. Fokien, China. *Proceedings of the Zoological Society of London* (1898): 769–775.

0271 On some small mammals from the District of Cuzco, Peru. *Annals and Magazine of Natural History; including Zoology, Botany and Geology, London (7)* **3**: 40–44.

0272 On a new species of *Marmosa*. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (7) **3**: 44–45.

0273 On new small mammals from South America. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (7) **3**. 152–155.

0274 Description of a new *Phascogale* from British New Guinea, obtained by Dr. L. Loria. *Annali di Museo Civico di Storia Naturale di Genova* (2a), (O.S. 40) **20**: 191–192.

0275 [Exhibition of the skull of a baboon recently obtained at Aden by Messrs. Percival and Dodson]. *Minutes of the Proceedings of the Zoological Society of London* 28 November: 7.

0276 Descriptions of new Neotropical mammals. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (7) **4**. 278–288.

0277 Descriptions of new rodents from the Orinoco and Ecuador. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (7) **4**: 378–383.

1900

0278 Exhibition of the skull of an apparently new species of baboon from Aden, proposed to be named *Papio arabicus*. *Proceedings of the Zoological Society of London* (1899): 929.

0279 A new bat from the Key Islands. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (7) **5**: 145.

0280 The geographical races of the tayra (*Galictis barbara*), with notes on abnormally coloured individuals. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (7) **5**: 145–148.

0281 New South-American mammals. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (7) **5**: 148–153.

0282 Description of a new fruit-bat from New Guinea. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (7) **5**: 216–217.

0283 Descriptions of new Neotropical mammals. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (7) **5**: 217–222.

0284 [Possible invalidity of *Thylacomys*.] [p. 223]. In Waite, E. R., The generic name *Thylacomys*. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (7) **5**: 222–223.

0285 [Exhibition of a kangaroo from northern Australia allied to *Macropus eugenii*.] *Minutes of the Proceedings of the Zoological Society of London* 20 February : 23.

0286 [Exhibition of a kangaroo from western Australia, apparently referable to *Macropus robustus*.] *Minutes of the Proceedings of the Zoological Society of London* 20 February: 23.

0287 [Enumeration of species obtained by Mr. H. J. Mackinder during his recent expedition to Mount Kenya, British East Africa.] *Minutes of the Proceedings of the Zoological Society of London* 20 February: 24–25.

0288 Exhibition of, and remarks upon, some mounted heads of antelopes from Fashoda and the Sobat River. *Proceedings of the Zoological Society of London* 84–85.

0289 On the mammals obtained in south-western Arabia by Messrs. Percival and Dodson. *Proceedings of the Zoological Society of London* 95–104.

0290 Exhibition of, and remarks upon, a skin of a new species of kangaroo, proposed to be called *Macropus bedfordi*. *Proceedings of the Zoological Society of London* 112–113.

0291 Exhibition of, and remarks upon, a skin of a new subspecies of kangaroo from western Australia, proposed to be named *Macropus robustus cervinus*. *Proceedings of the Zoological Society of London* 113.

0292 List of mammals obtained by Mr. H. J. Mackinder during his recent expedition to Mount Kenya, British East Africa. *Proceedings of the Zoological Society of London* 173–180, 1 fig.

0293 Descriptions of new Neotropical mammals. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (7) **5**: 269–274.

0294 Descriptions of two new Sciuropteri discovered by Mr. Charles Hose in Borneo. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (7) **5**: 275–276.

0295 Descriptions of two new murines from Peru and a new hare from Venezuela. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (7) **5**: 354–357.

0296 A new skunk from Peru. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (7) **5**: 499–500.

0297 On giant squirrels from the Amazonian region. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (7) **6**: 137–139.

0298 List of the mammals obtained by Dr. G. Franco Grillo in the Province of Parana, Brazil. *Annali di Museo Civico di Storia Naturale di Genova* (2a), (O.S. 40) **20**: 546–549.

0299 Descriptions of new rodents from western South America. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (7) **6**: 294–302.

0300 On the "Tohi", the East African reedbuck currently known as *Cervicapra bohor*. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (7) **6**: 303–304.

0301 Descriptions of new rodents from western South America. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (7) **6**: 383–387.

0302 A new dassie from north Nyasaland. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (7) **6**: 387.

0303 On *Equus penricei*, a representative of the mountain zebra (*Equus zebra* L.) discovered by Mr. W. Penrice in Angola. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (7) **6**: 465–466.

0304 New Peruvian species of *Conepatus*, *Phyllotis*, and *Akodon*. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (7) **6**: 466–469.

0305 The white rhinoceros on the Upper Nile. *Nature*, London 62: 599.

0306 The red flying squirrel of the Natuna Islands. *Novitates Zoologicae* **7**: 592.

0307 [Review of P. Matschie's "Die Fledermause des Berliner Museums fur Naturkunde".]

0308 [On mammals obtained by Dr. Donaldson Smith during his latest expedition from Somaliland by Lake Rudolf to the Upper Nile.] *Minutes of the Proceedings of the Zoological Society of London* 20 November: 4.

1901

0309 [Letter to Mr. P. L. Sclater regarding Thomas' proposals for formalizing the "Minutes" and "Abstracts" of the Proceedings of the Zoological Society of London.] Evidently printed by the Zoological Society of London as a broadsheet for circulation.

0310 List of mammals obtained by Dr. Donaldson Smith during his recent journey from Lake Rudolf to the Upper Nile. *Proceedings of the Zoological Society of London* (1900): 800–807.

0311 New mammals from Peru and Bolivia, with a list of those recorded from the Inambari River, Upper Madre de Dios. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (7) **7**: 178–190.

0312 A new free-tail bat from the Lower Amazons. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (7) **7**: 190–191.

0313 The generic names *Myrmecophaga* and *Didelphis*. *The American Naturalist*, Boston **35**: 143–145.

0314 New South American Sciuri, *Heteromys*, *Cavia*, and *Caluromys*. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (7) **7**: 192–196.

0315 On the mammals of the Balearic Islands. *Proceedings of the Zoological Society of London* **1**: 35–44.

0316 [Spanish article ("Una Traduccion") on collections from the Balearic Islands.] *'El Bien Publico'*, Mahin, 26 August.

0317 A new scotophiline bat from British East Africa, with the description of a new genus of the group. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (7) **7**: 263–265.

0318 New species of *Saccopteryx*, *Sciurus*, *Rhipidomys*, and *Tatu* from South America. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (7) **7**: 366–371.

0319 The name of the ogotona. *Proceedings of the Biological Society of Washington* **14**: 24.

0320 The name of the aard-vark. *Proceedings of the Biological Society of Washington* **14**: 24.

0321 The name of the viscacha. *Proceedings of the Biological Society of Washington* **14**: 25.

0322 A new spiny rat from La Guaira, Venezuela. *Proceedings of the Biological Society of Washington* **14**: 27–28.

0323 On a new genus and species of vespertilionine bat from British East Africa. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (7) **7**: 460–462.

0324 [On the more notable mammals lately obtained by Sir Harry Johnston in the Uganda Protectorate.] *Minutes of the Proceedings of the Zoological Society of London* 21 May: 45.

0325 On the more notable mammals obtained by Sir. Harry Johnston in the Uganda Protectorate. *Proceedings of the Zoological Society of London* **2**: 85–90, pl. 5.

0326 New *Myotis*, *Artibeus*, *Sylvilagus*, and *Metachirus* from central and South America. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (7) **7**: 541–545.

0327 [History of a specimen of *Rhinoceros lasiotis* in London Zoo; generic nomenclature of Rhinocerotidae.] *Minutes of the Proceedings of the Zoological Society of London* 4 June: 49–50.

0328 Notes on the type specimen of *Rhinoceros lasiotis* Sclater; with remarks on the generic position of the living species of rhinoceros. *Proceedings of the Zoological Society of London* **2**: 154–158.

0329 [Exhibition of a pair of antlers which had been sent home by Mr. Charles Hose, who had obtained them from central Borneo.] *Minutes of the Proceedings of the Zoological Society of London* 18 June: 54.

0330 [On *Cervus spatulatus*, sp. n.] [An unpublished proof, with three illustrations of the antlers, intended for the *Proceedings of the Zoological Society of London*. In Thomas' collected works].

0331 Some new African bats (including one from the Azores) and a new galago. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (7) **8**: 27–34.

0332 On a collection of mammals from the Kanuko Mountains, British Guiana. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (7) **8**: 139–154.

0333 List of small mammals obtained by Mr. A. E. Pease, M.P., during his recent expedition to Abyssinia, with descriptions of three new forms of *Macroscelides*. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (7) **8**: 154–156.

0334 On a new form of puma from Patagonia. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (7) **8**: 188–189.

0335 On a collection of bats from Para. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (7) **8**: 189–193.

0336 New Neotropical mammals, with a note on the species of *Reithrodon*. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (7) **8**: 246–255.

0337 New species of *Macroscelides* and *Glauconycteris*. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (7) **8**: 255–257.

0338 New insular forms of *Nasua* and *Dasyprocta*. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (7) **8**: 271–273.

0339 On a collection of small mammals from the Upper Nile obtained by Mr. R. M. Hawker. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (7) **8**: 273–278.

0340 On a collection of bats from Paraguay. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (7) **8**: 435–443.

0341 On mammals obtained by Mr. Alphonse Robert on the Rio Jordao, S.W. Minaes Geraes. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (7) **8**: 526–536.

0342 New species of *Oryzomys*, *Proechimys*, *Cavia*, and *Sylvilagus* from South America. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (7) **8**: 536–539.

0343 On some kangaroos and bandicoots from Barrow Island and the mainland. *Novitates Zoologicae*, London **8**: 394–396.

0344 Antilope nouvelle. *Cephalophus weynsi*. *Annales du Musee Royal du Congo Belge*, Bruxelles, Tervuren, (C), Zoologie **2**: 15–16, pl. 6.

0345 [On a five-horned giraffe obtained by Sir Harry Johnston near Mount Elgon.] *Minutes of the Proceedings of the Zoological Society of London* 19 November: 4.

1902

0346 On the five-horned giraffe obtained by Sir Harry Johnston near Mount Elgon. *Proceedings of the Zoological Society of London* (1901) **2**: 474–483, figs. 42–48.

0347 Remarks on the reproduction of the duckbill. *Proceedings of the Zoological Society of London* (1901) **2**: 624–625. [With G. Metcalfe].

0348 A new blue duiker from Nyasaland. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (7) **9**: 58–59.

0349 On mammals from the Serra do Mar, Parana, collected by Mr. Alphonse Robert. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (7) **9**: 59–64.

0350 On mammals from Cochabamba, Bolivia, and the region north of that place. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (7) **9**: 125–143.

0351 [A description of two new rodents discovered by Mr. P. O. Simons near Potosi, Bolivia.] *Minutes of the Proceedings of the Zoological Society of London* 18 February: 24.

0352 [On some new mammals from northern Nyasaland.] *Minutes of the Proceedings of the Zoological Society of London* 18 February: 24.

0353 Exhibition of, and remarks upon, the skin and skull of a yellow-backed duiker (*Cephalophus sylvicultrix*) from N.E. Rhodesia. *Proceedings of the Zoological Society of London* **1**: 1–2.

0354 On two new genera of rodents from the highlands of Bolivia. *Proceedings of the Zoological Society of London* **1**: 114–117, pls. 8, 9 [figs. 1–12].

0355 On some new mammals from northern Nyasaland. *Proceedings of the Zoological Society of London* **1**: 118–121.

0356 On the bear of Ecuador. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (7) **9**: 215–217.

0357 On two new species of *Mus* discovered by Mr. S. L. Hinde in British East Africa. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (7) **9**: 218–220.

0358 On a new genus of vespertilionine bat from New Guinea. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (7) **9**: 220–222.

0359 On mammals collected by Mr. Perry O. Simons in the southern part of the Bolivian Plateau. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (7) **9**: 222–230.

0360 On mammals collected at Cruz del Eje, central Cordova, by Mr. P. O. Simons. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (7) **9**: 237–245.

0361 On the geographical races of the kinkajou. *Annals and Magazine of Natural History; including Zoology, Botany and Geology, London (7)* **9**: 266–269.

0362 On a new species of *Atherura* discovered by Capt. Guy Burrows on the Congo. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (7) **9**: 269–271.

0363 A new *Hipposiderus* from Borneo. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (7) **9**: 271–272.

0364 New species of *Dipodillus* and *Psammomys*. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (7) **9**: 362–365.

0365 A new genet from British East Africa. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (7) **9**: 365–366.

0366 [On the mammals obtained during the Whitaker expedition to Tripoli.] *Minutes of the Proceedings of the Zoological Society of London* 6 May: 39.

0367 On the mammals collected during the Whitaker expedition to Tripoli. *Proceedings of the Zoological Society of London* **2**: 2–13.

0368 The *Lycaon* and *Pedetes* of British East Africa, and a new gerbille from N. Nyasa. I. *Lycaon* [pp. 438–440]. II. *Pedetes* [pp. 440–441]. III. *Tatera liodon* sp. nov. [pp. 441–442]. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (7) **9**: 438–442.

0369 On the species of *Mydaus* found in Borneo and the Natuna Islands. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (7) **9**: 442–444.

0370 On a new marmot from north Siberia. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (7) **9**: 444–445.

0371 Description of a new *Uromys* from the Solomon Islands. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (7) **9**: 446–447.

0372 The generic names of the peccaries, northern fur seal, and sea leopard. *Proceedings of the Biological Society of Washington* **15**: 153–154.

0373 Notes on the phyllostomatous genera *Mimon* and *Tonatia*. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (7) **10**: 53–54.

0374 A method of fixing the type in certain genera. *Science*, New York (N.S.), **16**: 114–115. [With numerous others].

0375 On *Marmosa marmota* and *elegans*, with descriptions of new subspecies of the latter. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (7) **10**: 158–162.

0376 The genet of the Balearic Islands. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (7) **10**: 162–163.

0377 On two new mammals from China. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (7) **10**: 163–166.

0378 A new vole from the Lower Yang-tse-kiang. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (7) **10**: 166–169.

0379 Diagnosis of a new Central American porcupine. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (7) **10**: 169.

0380 A new dik-dik from British East Africa. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (7) **10**. 242–243.

0381 On a new monkey from Nyasaland. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (7) **10**: 243–244.

0382 On two new hares allied to *Oryctolagus crassicaudatus*. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (7) **10**: 244–246.

0383 New forms of *Saimiri, Phyllotis, Coendou*, and *Cyclopes*. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (7) **10**: 246–250.

0384 On the panda of Sze-chuen. *Annals and Magazine of Natural History; including Zoology, Botany and Geology* (7) **10**: 251–252.

0385 On the East-African representative of the bongo and its generic position. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (7) **10**: 309–310.

0386 On some new forms of *Otomys*. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (7) **10**: 311–314.

0387 [Exhibition of, and remarks upon, the East African representative of the bongo antelope, *Boocercus euryceros isaaci.*] *Minutes of the Proceedings of the Zoological Society of London* 18 November: 7.

0388 A new *Rynchocyon* from Nyasaland. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (7) **10**: 403–404.

0389 On five new mammals from Arabia and Persia. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (7) **10**: 487–491.

0390 Two new Australian small mammals. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (7) **10**: 491–492.

0391 On Azara's "Chauve-souris onzieme" (*Myotis ruber*, Geoff.) and a new species allied to it. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (7) **10**: 493–494.

0392 On the mole of the Roman district. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (7) **10**: 515–517.

0393 On the generic names *Notophorus*, *Alces*, *Dama*, and *Cephalotes*, with remarks on the "one-letter rule" in nomenclature. *Proceedings of the Biological Society of Washington* **15**: 197–198.

0394 On some mammals from Coiba Island, off the west coast of Panama. *Novitates Zoologicae* **9**: 135–137.

1903

0395 On a collection of mammals from Abyssinia, including some from Lake Tsana, collected by Mr. Edward Degen. *Proceedings of the Zoological Society of London* (1902) **2**: 308–316.

0396 Exhibition of, and remarks upon, some specimens of the East-African bongo antelope (*Boocercus euryceros isaaci*). *Proceedings of the Zoological Society of London* (1902) **2**: 319–320.

0397 On a remarkable new hare from Cape Colony. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (7) **11**: 78–79.

0398 On two new squirrels of the *Funisciurus pyrrhopus* group. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (7) **11**: 79–81.

0399 New species of *Oxymycterus*, *Thrichomys*, and *Ctenomys* from South America. *Annals and Magazine of Natural History; including Zoology, Botany and Geology* (7) **11**: 226–229.

0400 Two new glossophagine bats from Central America. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (7) **11**: 286–289.

0401 Note on the technical name of the Tasmanian devil. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (7) **11**: 289.

0402 A new duiker from West Africa. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (7) **11**: 289–291.

0403 On a collection of mammals from the small islands off the coast of western Panama. *Novitates Zoologicae* **10**: 39–42.

0404 [Exhibition of the skin of a monkey from Kweichow, China.] *Minutes of the Proceedings of the Zoological Society of London* 17 March: 29.

0405 [Exhibition of adult and young examples of a new bush duiker from British East Africa.] *Minutes of the Proceedings of the Zoological Society of London* 17 March: 29.

0406 New mammals from Chiriqui. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (7) **11**: 376–382.

0407 Two South American forms of *Rhogeessa*. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (7) **11**: 382–383.

0408 [On some mammals collected by Capt. H. N. Dunn, R.A.M.C., in the Egyptian Sudan.] *Minutes of the Proceedings of the Zoological Society of London* 21 April: 33.

0409 On three new forms of *Peromyscus* obtained by Dr. Hans Gadow, F.R.S., and Mrs. Gadow in Mexico. *Annals and Magazine of Natural History including Zoology, Botany and Geology*, London (7) **11**: 484–487.

0410 New forms of *Sciurus*, *Oxymycterus*, *Kannabateomys*, *Proechimys*, *Dasyprocta*, and *Caluromys* from South America. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (7) **11**: 487–493.

0411 Two new dormice of the genus *Eliomys*. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (7) **11**: 494–496.

0412 On the species of the genus *Rhinopoma*. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (7) **11**: 496–499.

0413 [Exhibition of the skull of a remarkable form of *Gazella granti.*] *Minutes of the Proceedings of the Zoological Society of London* 16 June: 44.

0414 On two new Muridae from Smyrna. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (7) **12**: 188–190.

0415 Note sur les rongeurs de Tunisie recueillis par M. Marius Blanc. *Bulletin de la Société Zoologique de France*, Paris **28**: 171–174. [With E. Trouessart].

0416 On a small collection of mammals from the Rio de Oro, western Sahara. *Novitates Zoologicae* **10**: 300–302.

0417 Notes on Neotropical mammals of the genera *Felis, Hapale, Oryzomys, Akodon,* and *Ctenomys*, with descriptions of new species. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (7) **12**: 234–243.

0418 Exhibition of a skin and description of a new species of monkey, *Rhinopithecus brelichi*. *Proceedings of the Zoological Society of London* **1**: 224–225, pl. 21.

0419 Exhibition of specimens and description of a new species of duiker, *Cephalophus ignifer*. *Proceedings of the Zoological Society of London* **1**: 225–226.

0420 On some mammals collected by Capt. H. N. Dunn, R.A.M.C., in the Soudan. *Proceedings of the Zoological Society of London* **1**: 294–301.

0421 New African Mammalia of the genera *Petrodromus, Dendromys, Mus* and *Lepus*. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (7) **12**: 339–344.

0422 Notes on South American monkeys, bats, carnivores, and rodents, with descriptions of new species. *Annals and Magazine of Natural History, including Zoology, Botany and Geology*, London (7) **12**: 455–464.

0423 A new mungoose from Namaqualand. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (7) **12**: 465–466.

0424 Exhibition of, and remarks upon, the horns of a new form of Grant's gazelle, proposed to be named *Gazella granti robertsi*. *Proceedings of the Zoological Society of London* **2**: 119–121.

0425 Three new species of *Nyctinomus*. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (7) **12**: 501–505.

0426 Three new bats from the Cameroons, discovered by Mr. G. L. Bates. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (7) **12**: 633–635.

0427 [Exhibition of three new mammals from British New Guinea, collected by Mr. A. S. Meek.] *Minutes of the Proceedings of the Zoological Society of London* 3 November: 4.

0428 [On mammals collected at Chapada by Mr. A. Robert during the Percy Sladen Expedition to Central-Brazil.] *Minutes of the Proceedings of the Zoological Society of London* 3 November: 4–5.

1904

0429 Exhibition of specimens and descriptions of new species of mammals from New Guinea. *Proceedings of the Zoological Society of London* (1903) **2**: 196–202, pl. 23.

0430 On the mammals collected by Mr. A. Robert at Chapada, Matto Grosso, (Percy Sladen Expedition to Central Brazil.). *Proceedings of the Zoological Society of London* (1903) **2**: 232–244, pl. 27.

0431 Exhibition of, on behalf of Mr. W. E. de Winton, F.Z.S., a drawing of a female gazelle bearing a hair-whorl on the withers. *Proceedings of the Zoological Society of London* (1903) **2**: 317–318, fig. 35.

0432 Exhibition of, and remarks upon, a specimen of the rodent *Fornarina* (gen. nov.) *phillipsi* and description of *Heterocephalus ansorgei* (sp. nov.). *Proceedings of the Zoological Society of London* (1903) **2**: 336–337.

0433 [Exhibition of a gazelle obtained by Mr. A. E. Butter in N.E. Africa.] *Abstracts of the Proceedings of the Zoological Society* of London 19 January, No. 1: 1–2.

0434 [A collection of mammals from Namaqualand presented to the British Musem by Mr. C.D. Rudd.] *Abstracts of the Proceedings of the Zoological Society of London* 2 February, No. 2: 5–6. [With H. Schwann].

0435 Two new mammals from South America. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (7) **13**: 142–144

0436 On a collection of mammals made by Mr. J. T. Tunney in Arhem Land, Northern Territory of South Australia. *Novitates Zoologicae* **11**: 222–229.

0437 On a new rock-wallaby from north-west Australia. *Novitates Zoologicae* **11**: 365–366.

0438 [Exhibition of the skull of a buffalo obtained by Col. Delme-Radcliffe in Ankole, S.W. Uganda.] *Abstracts of the Proceedings of the Zoological Society of London* 1 March, No. 4: 13.

0439 [Exhibiton of a rare fruit-bat of the genus *Scotonycteris* obtained in Fernando Po.] *Abstracts of the Proceedings of the Zoological Society of London* 1 March, No. 4: 13–14.

0440 New bats from British East Africa collected by Mrs. Hinde and from the Cameroons by Mr. G. L. Bates. *Annals and Magazine of Natural History, including Zoology, Botany and Geology*, London (7) **13**: 206–210.

0441 New forms of *Saimiri, Saccopteryx, Balantiopteryx*, and *Thrichomys* from the Neotropical region. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (7) **13**: 250–255.

0442 [Exhibition of skulls of a small North Australian rock-wallaby (*Peradorcas concinna* Gould.).] *Abstracts of the Proceedings of the Zoological Society of London* 19 April, No. 6:21.

0443 [Exhibition of the skin and skull of a hartebeest shot by Mr. F. J. Jackson in Uganda.] *Abstracts of the Proceedings of the Zoological Society of London* 19 April, No. 6: 21–22.

0444 [An account of the mammals obtained by Mr. W. G. Doggett on the Anglo-German Boundary Commission.] *Abstracts of the Proceedings of the Zoological Society of London* 19 April, No. 6: 22–23.

0445 A new bat from the United States, representing the European *Myotis (Leuconoe) daubentoni*. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (7), **13**: 382–384.

0446 Three new bats, African and Asiatic. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (7) **13**: 384–388.

0447 On mammals from northern Angola collected by Dr. W. J. Ansorge. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (7) **13**: 405–421, 2 figs.

0448 Exhibition of a skin and skull and description of a new subspecies of gazelle, *Gazella soemmerringii butteri*. *Proceedings of the Zoological Society of London* **1**: 4–5.

0449 On a collection of mammals from British Namaqualand, presented to the National Museum by Mr. C. D. Rudd. *Proceedings of the Zoological Society of London* **1**: 171–183, pl. 6 [figs 1–2]. [With H. Schwann].

0450 New *Sciurus, Rhipidomys, Sylvilagus*, and *Caluromys* from Venezuela. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (7) **14**: 33–37.

0451 Ergebnisse zoologischer Forschungsreisen in Sumatra O. K. *Zoologischer Anzeiger* **27**: 722–724. [With G. Schneider].

0452 On a collection of mammals obtained in Somaliland by Major H. N. Dunn, R.A.M.C., with descriptions of allied species from other localities. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (7) **14**: 94–105, 1 fig.

0453 On some small mammals collected by Mr. A. M. Mackilligin in the Eastern Desert of Egypt. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (7) **14**: 155–159.

0454 Exhibition of, and remarks upon, the skull of a new form of buffalo from Uganda. *Proceedings of the Zoological Society of London* **1**: 371.

0455 Exhibition and description of a new species of fruit-bat from Fernando Po. *Proceedings of the Zoological Society of London* **1**: 371–372.

0456 Exhibition of a skin and description of a new subspecies of hartebeest from Uganda. *Proceedings of the Zoological Society of London* **1**: 455–456.

0457 On mammals collected during the Uganda Boundary Commission by the late Mr. W. G. Doggett, and presented to the British Museum by Col. C. Delme-Radcliffe. *Proceedings of the Zoological Society of London* **1**: 459–465, fig. 95.

0458 New species of *Pteropus, Mus* and *Pogonomys* from the Australian region. *Novitates Zoologicae* **11**: 597–600.

0459 New *Callithrix, Midas, Felis, Rhipidomys*, and *Proechimys* from Brazil and Ecuador.

Annals and Magazine of Natural History; including Zoology, Botany and Geology, London (7) **14**: 188–196.

0460 New bats and rodents from West Africa, the Malay Peninsula, and Papuasia. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (7) **14**: 196–202.

0461 On shrews from British East Africa. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (7) **14**: 236–241.

0462 On the osteology and systematic position of the rare Malagasy bat *Myzopoda aurita*. *Proceedings of the Zoological Society of London* **2**: 2–6, pl. 1 [figs. 1–8].

0463 The forest pig of Central Africa. Nature, London **70**: 577.

0464 [Mammals obtained in the island of Fernando Po by Mr. E. Seimund.] *Abstracts of the Proceedings of the Zoological Society of London* 15 November, No. 10: 12.

0465 [On *Hylochoerus*, the forest-pig of Central Africa.] *Abstracts of the Proceedings of the Zoological Society of London* 15 November, No. 10: 12–13.

0466 On some mammals from British New Guinea presented to the National Museum by Mr. C. A. W. Monckton, with descriptions of other species from the same region. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (7) **14**: 397–403.

0467 [Exhibition of a pair of gazelles from Jerusalem.] *Abstracts of the Proceedings of the Zoological Society of London* 13 December, No. 12: 19.

1905

0468 On mammals from the island of Fernando Po. *Proceedings of the Zoological Society of London* (1904) **2**: 183–193, pl. 13.

0469 On *Hylochoerus*, the forest pig of central Africa. *Proceedings of the Zoological Society of London* (1904), **2**: 193–199, pl. 14 [figs. 1–3], 15 [figs. 1–5].

0470 Exhibition of specimens and description of a new gazelle from Palestine. *Proceedings of the Zoological Society of London* (1904) **2**: 347–349.

0471 New African mammals of the genera *Glauconycteris*, *Lutra*, *Funisciurus*, *Arvicanthus*, *Lophiomys*, and *Procavia*. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (7) **15**: 77–83.

0472 [An account of a second collection of mammals made by Mr. C. H. B. Grant for Mr. C. D. Rudd's exploration of South Africa.] *Abstracts of the Proceedings of the Zoological Society of London* 21 February, no. 15: 10. [With H. Schwann].

0473 A new *Cricetulus* from Mongolia. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (7) **15**: 322–323.

0474 New ground squirrels of the *Xerus erythropus* group. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (7) **15**: 387–390.

0475 [Account of a third collection of mammals made by Mr. C. H. B. Grant for Mr. C. D. Rudd's exploration of South Africa.] *Abstracts of the Proceedings of the Zoological Society of London* 18 April, No. 18: 23. [With H. Schwann].

0476 On some new Japanese mammals presented to the British Museum by Mr. R. Gordon Smith. *Annals and Magazine of Natural History: including Zoology, Botany and Geology*, London (7) **15**: 487–495, 1 fig.

0477 [Exhibition of a new golden mole obtained in connection with Mr. C. D. Rudd's exploration of South Africa. *Abstracts of the Proceedings of the Zoological Society of London* 16 May, No. 20: 5.

0478 New Neotropical *Molossus*, *Conepatus*, *Nectomys*, *Proechimys*, and *Agouti*, with a note on the genus *Mesomys*. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (7) **15**: 584–591.

0479 The Rudd exploration of South Africa. II. List of mammals from the Wakkerstroom District, south-eastern Transvaal. *Proceedings of the Zoological Society of London* **1**: 129–138. [With H. Schwann].

0480 [Exhibition of a new bushbuck.] *Abstracts of the Proceedings of the Zoological Society of London* 6 June, No. 21: 9.

0481 [Exhibition of mammals and birds from Japan.] *Abstracts of the Proceedings of the Zoological Society of London* 6 June, No. 21: 9–10.

0482 On a second collection of mammals obtained by Dr. W. J. Ansorge in Angola. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (7) **16**: 169–178. [With R. C. Wroughton].

0483 The Rudd exploration of South Africa. III. List of the mammals obtained by Mr. Grant in Zululand. *Proceedings of the Zoological Society of London* **1**: 254–276, pl. 16. [With H. Schwann].

0484 New Neotropical *Chrotopterus, Sciurus, Neacomys, Coendou, Proechimys*, and *Marmosa*. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (7) **16**: 308–314.

0485 On a remarkable new squirrel from Borneo. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (7) **16**: 314–315.

0486 Suggestions for the nomenclature of the cranial length measurements and of the cheek teeth of mammals. *Proceedings of the Biological Society of Washington* **18**: 191–196, 1 fig.

0487 On some Australasian mammals. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (7) **16**: 422–428.

0488 The generic names given by Frisch in 1775. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (7) **16**: 461–464.

0489 Description of a new golden mole (*Amblysomus corriae*) from Cape Colony. *Proceedings of the Zoological Society of London* **2**: 57–58.

0490 Description of a new bushbuck (*Tragelaphus haywoodi*) from British East Africa. *Proceedings of the Zoological Society of London* **2**: 180–182.

0491 Exhibition of specimens of mammals and birds from Japan and description of a new marten (*Mustela melampus bedfordi*). *Proceedings of the Zoological Society of London* **2**: 182–183.

0492 A new genus and two new species of bats. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (7) **16**: 572–576.

0493 [Paper on mammals collected in Japan by Mr. M. P. Anderson for His Grace the Duke of Bedford.] *Abstracts of the Proceedings of the Zoological Society of London* 28 November, No. 23: 18–19.

0494 [Exhibition of the tail vertebrae of a dormouse of the genus *Eliomys*.] *Abstracts of the Proceedings of the Zoological Society of London* 12 December, No. 24: 21.

0495 [On a collection of mammals obtained by Col. A. C. Bailward in Persia and Armenia.] *Abstracts of the Proceedings of the Zoological Society of London* 12 December, No. 24: 21–22.

1906

0496 The Duke of Bedford's zoological exploration in eastern Asia. I. List of mammals obtained by Mr. M. P. Anderson in Japan. [With Appendix [pp. 357–363] on collections from the islands of Oki, Yakushima, and Tanegashima]. *Proceedings of the Zoological Society of London* (1905) **2**: 331–363, pl. 9.

0497 Exhibition of, and remarks upon, tails of dormice showing regeneration of vertebrae. *Proceedings of the Zoological Society of London* (1905) **2**: 481–494, figs. 70–71.

0498 On a collection of mammals from Persia and Armenia presented to the British Museum by Col. A. C. Bailward. *Proceedings of the Zoological Society of London* (1905) **2**: 519–527, pl. 16.

0499 On the generic arrangement of the Australian rats hitherto referred to *Conilurus*, with remarks on the structure and evolution of their molar cusps. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (7) **17**: 81–85.

0500 A new aquatic genus of Muridae discovered by Consul L. Soderstrom in Ecuador. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (7) **17**: 86–88.

0501 On a second species of *Lenothrix* from the Liu Kiu Islands. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (7) **17**: 88–89.

0502 [Exhibition of the skull of a forest-pig (*Hylochoerus*) sent by Mr. G. L. Bates from the Cameroon.] *Abstracts of the Proceedings of the Zoological Society of London* 16 January, No. 25: 1–2.

0503 New African mammals of the genera *Cercopithecus, Scotophilus, Minopterus, Crocidura,*

Georychus, and *Heliophobius*. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (7) **17**: 173–179.

0504 [An account of a collection of mammals made by Mr. C. H. B. Grant at Knysna, Cape Colony.] *Abstracts of the Proceedings of the Zoological Society of London* 20 February, No. 27: 10. [With H. Schwann].

0505 New mammals from the Australian region. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (7) **17**: 324–332.

0506 [Exhibition of a brown bear from the Shan States.] *Abstracts of the Proceedings of the Zoological Society of London* 20 March, No. 29: 17.

0507 "Legalised murder". *Evening Standard and St. James Gazette*, London. 27 March. [Signed 'Euthanasia' but bound into Thomas' collected works. In favour of 'legalised suicide'].

0508 New insectivores and voles collected by Mr. A. Robert near Trebizond. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (7) **17**: 415–421.

0509 A third genus of the *Ichthyomys* group. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (7) **17**: 421–423.

0510 New Asiatic mammals of the genera *Kerivoula*, *Eliomys*, and *Lepus*. *Annals and Magazine of Natural History, including Zoology, Botany and Geology*, London (7) **17**: 423–426.

0511 On a new genus of free-tail bat from N.E. Africa. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (7) **17**: 499–501.

0512 [Exhibition of the skin of a remarkable new duiker from Nyasaland, which had been presented to the British Museum by Mr. S. W. Frank.] *Abstracts of the Proceedings of the Zoological Society of London* 1 May, No. 31: 1.

0513 [On mammals collected in south-west Australia for Mr. W. E. Balston.] *Abstracts of the Proceedings of the Zoological Society of London* 1 May, No. 31: 1–2.

0514 [On a collection of mammals made by Mr. W. Stalker in the Northern Territory of South Australia and presented to the National Collection by Sir William Ingram, Bart., and the Hon. John Forrest.] *Abstracts of the Proceedings of the Zoological Society of London* 15 May, No. 32: 6.

0515 [On mammals collected by Mr. C. H. B. Grant in the Zoutpansberg District of the Transvaal, and presented to the National Collection by Mr. C. D. Rudd.] *Abstracts of the Proceedings of the Zoological Society of London* 29 May, No. 33: 10.

0516 A new vole from Spain. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (7) **17**: 576–577.

0517 Exhibition of, and remarks upon, the skull of a new forest-pig. *Proceedings of the Zoological Society of London* **1**: 2–3, fig. 1.

0518 The Rudd exploration of South Africa.—IV. List of mammals obtained by Mr. Grant at Knysna, Cape Colony. *Proceedings of the Zoological Society of London* 1: 159–168.

0519 Descriptions of new mammals from Mount Ruwenzori. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (7) **18**: 136–147.

0520 On a new pygmy antelope obtained by Col. J. J. Harrison in the Semliki Forest. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (7) **18**: 148–150.

0521 Description of a new subspecies of bear, *Ursus arctos shanorum*. *Proceedings of the Zoological Society of London* **1**: 231–232, fig. 58.

0522 Three new Palaearctic mammals. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (7) **18**: 220–222.

0523 Two new genera of small mammals discovered by Mrs. Holms-Tarn [spelt Holms-Tarn in title and in text, but with manuscript correction to Holmes-Tarn by Thomas in his collected works] in British East Africa. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (7) **18**: 222–226.

0524 On some African bats and rodents. *Annals and Magazine of Natural History; including Zoology, Botany and Geology* (7) **18**: 294–299.

0525 New mammals collected in north-east Africa by Mr. Zaphiro, and presented to the British Museum by W. N. McMillan, Esq. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (7) **18**: 300–306.

0526 A new species of duiker. *Proceedings of the Zoological Society of London* **2**: 463–464, pl. 35.

0527 On mammals collected in southwest Australia for Mr. W. E. Balston. *Proceedings of the Zoological Society of London* **2**: 468–478.

0528 On mammals from northern Australia presented to the National Museum by Sir. Wm. Ingram, Bt., and the Hon. John Forrest. *Proceedings of the Zoological Society of London* **2**: 536–543, pl. 37 [figs. 1–2].

0529 The Rudd exploration of South Africa.—V. List of mammals obtained by Mr. Grant in N.E. Transvaal. *Proceedings of the Zoological Society of London* **2**: 575–591. [With H. Schwann].

0530 [*Suggested amendments to the report of the Committee on Zoological Nomenclature laid before the International Congress on Zoology, held at Boston, Mass. in 1907.*] Linnean Society of London: 1–4.

0531 Notes on South-American rodents. I.—A new name for *Sciurus roberti*, Thos. [p. 442]. II. – On the allocation of certain species hitherto referred respectively to *Oryzomys*, *Thomasomys*, and *Rhipidomys* [pp. 442–445]. III. – A new *Oecomys* and two new species of *Holochilus* [pp.445–448]. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (7) **18**: 442–448.

0532 Note on *Limnomys*. *Proceedings of the Biological Society of Washington* **19**: 199.

0533 1. *Mammals*. In: *The history of the collections contained in the Natural History Departments of the British Museum* **2**: 3–66. London: Trustees of the British Museum (Natural History).

1907

0534 List of further collections of mammals from western Australia, including a series from Bernier Island, obtained for Mr. W. E. Balston; with field notes by the collector, Mr. G. C. Shortridge. [With an appendix on a collection from Bernier Island, pp. 772–777]. *Proceedings of the Zoological Society of London* (1906): 763–777.

0535 The Rudd exploration of South Africa.—VI. List of mammals obtained by Mr. Grant in the eastern Transvaal. *Proceedings of the Zoological Society of London* (1906): 779–782. [With H. Schwann].

0536 The Duke of Bedford's zoological exploration in eastern Asia. II.—List of small mammals from Korea and Quelpart. *Proceedings of the Zoological Society of London* (1906): 858–865.

0537 On further new mammals obtained by the Ruwenzori Expedition. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (7) **19**: 118–123.

0538 [Exhibition of the skin of a new monkey from the Ituri Forest, obtained during the recent Ruwenzori Expedition.] *Abstracts of the Proceedings of the Zoological Society of London* 15 January, No. 38: 1.

0539 [On mammals collected in Mindanao, Philippines, by Mr. M. P. Anderson, for the Duke of Bedford's exploration of eastern Asia.] *Abstracts of the Proceedings of the Zoological Society of London* 5 February, No. 39: 5.

0540 New mammals from Lake Chad and the Congo, mostly from the collections made during the Alexander-Gosling Expedition. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (7) **19**: 369–387.

0541 On a remarkable mountain viscacha from southern Patagonia, with diagnoses of other members of the group. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (7) **19**: 339–444.

0542 On the occurrence of the edible dormouse (*Glis*) in Sardinia. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (7) **19**: 444–445.

0543 New mammals from Lake Chad and the Congo, mostly from the collections made during the Alexander-Gosling Expedition. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (7) **19**: 519–521.

0544 On Buffon's "Porc-Epic de Malaca". *Proceedings of the Biological Society of Washington* **20**: 65.

0545 A new monkey from the Ituri forest. *Proceedings of the Zoological Society of London* 2–3, pl. 1.

0546 Exhibition of a collection of mammals and birds from the islands of Saghalien and Hokkaido. *Proceedings of the Zoological Society of London* 100.

0547 The Duke of Bedford's zoological exploration in eastern Asia.—III. On mammals obtained

by Mr. M. P. Anderson in the Philippine Islands. *Proceedings of the Zoological Society of London* 140–142.

0548 On three new mammals from British New Guinea. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (7) **20**: 70–74.

0549 On Neotropical mammals of the genera *Callicebus*, *[Grison]*, *Reithrodontomys*, *Ctenomys*, *Dasypus*, and *Marmosa*. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (7) **20**: 161–168. [*Grison* omitted from title but added in manuscript by Thomas in his collected works].

0550 The Rudd exploration of South Africa.—VII. List of mammals obtained by Mr. Grant at Coguno, Inhambane. *Proceedings of the Zoological Society of London* 285–299. [With R. C. Wroughton].

0551 The Duke of Bedford's zoological exploration in eastern Asia.—IV. List of small mammals from the islands of Saghalien and Hokkaido. (With appendix on the cold-blooded vertebrates, by G. A. Boulenger [p. 414]). *Proceedings of the Zoological Society of London* 404–414.

0552 On mammals from northern Persia, presented to the National Museum by Col. A. C. Bailward. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (7) **20**: 196–202.

0553 A subdivision of the old genus *Nesokia*, with descriptions of three new members of the group, and of a *Mus* from the Andamans. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (7) **20**: 202–207.

0554 On the occurrence of *Acanthoglossus* in British New Guinea. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (7) **20**: 293–294.

0555 The Duke of Bedford's zoological exploration in eastern Asia.—V. Second list of mammals from Korea. *Proceedings of the Zoological Society of London* 462–466.

0556 On a new dormouse from Asia Minor, with remarks on the subgenus "*Dryomys*". *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (7) **20**: 406–407.

0557 A new *Acanthoglossus* from the island of Salawatti. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (7) **20**: 498–499.

0558 A new flying squirrel from Formosa. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (7) **20**: 522–523.

1908

0559 The Rudd exploration of South Africa.—VIII. List of mammals obtained by Mr. Grant at Beira. *Proceedings of the Zoological Society of London* (1907): 774–782.

0560 The genera and subgenera of the *Sciuropterus* group, with descriptions of three new species. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (8) **1**: 1–8.

0561 The species of the genus *Dactylopsila*. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (8) **1**: 122–124.

0562 On a new oribi obtained by Major Powell-Cotton in British East Africa. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (8) **1**: 177–178. [With R. C. Wroughton].

0563 On the large flying squirrels referred to *Petaurista nitida*, Desm. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (8) **1**: 250–252.

0564 The nomenclature of the flying-lemurs. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (8) **1**: 252–255.

0565 The missing premolar of the Chiroptera. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (8) **1**: 346–348.

0566 A new deer of the brocket group from Venezuela. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (8) **1**: 349–350.

0567 On the generic position of the groups of squirrels typified by "*Sciurus*" *berdmorei* and *pernyi* respectively, with descriptions of some new oriental species. *Journal of the Bombay Natural History Society* **18**: 244–249.

0568 On certain African and S.—American otters. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (8) **1**: 387–395.

0569 New Asiatic *Apodemus*, *Evotomys*, and *Lepus*. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (8) **1**: 447–450.

0570 [On mammals collected by Mr. C. H. B. Grant near Tette, Zambesia, and resume of the results of the Rudd exploration of South Africa.] *Abstracts of the Proceedings of the Zoological Society of London* 26 May, No. 59: 27–28.

0571 The nomenclature of certain lorises. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (8) **1**: 467–469.

0572 [On mammals from the Provinces of Chih-li and Shan-si, N. China, collected by Mr. M. P. Anderson for the Duke of Bedford's zoological exploration of eastern Asia.] *Abstracts of the Proceedings of the Zoological Society of London* 16 June, No. 60: 32.

0573 The Duke of Bedford's zoological exploration in eastern Asia.—VI. List of mammals from the Shantung Province, north China. *Proceedings of the Zoological Society of London* 5–10.

0574 The Duke of Bedford's zoological exploration of eastern Asia.—VII. List of mammals from the Tsu-shima Islands. *Proceedings of the Zoological Society of London* 47–54.

0575 The Duke of Bedford's zoological exploration of eastern Asia.—IX. List of mammals from the Mongolian Plateau. *Proceedings of the Zoological Society of London* 104–110.

0576 Four new Amazonian monkeys. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (8) **2**: 88–91.

0577 The *Psammomys* of the alluvial soil of the Nile Delta. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (8) **2**: 91–92.

0578 Note on the squirrel genus "*Zetis*". *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (8) **2**: 136.

0579 On mammals from the Malay Peninsula and Islands. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (8) **2**: 301–306.

0580 A new jerboa from China. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (8) **2**: 307–308.

0581 The Rudd exploration of South Africa.—IX. List of mammals obtained by Mr. Grant on the Gorongoza Mountains, Portuguese Southeast Africa. *Proceedings of the Zoological Society of London* 164–173. [With R. C. Wroughton].

0582 New bats and rodents in the British Museum collection. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (8) **2**: 370–375.

0583 A new fruit bat from Sierra Leone. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (8) **2**: 375–376.

0584 The Rudd exploration of South Africa.—X. List of mammals obtained by Mr. Grant near Tette, Zambesia. *Proceedings of the Zoological Society of London* 535–553. [With R. C. Wroughton].

0585 The Duke of Bedford's zoological exploration in eastern Asia.—X. List of mammals from the Provinces of Chih-li and Shan-si, northern China. *Proceedings of the Zoological Society of London* 635–646, pl. 32.

0586 On mammals collected by Mr. H. C. Robinson on Tioman and Aor Islands, South China Sea. *Journal of the Federated Malay States Museums*, Kuala Lumpur **2**: 101–106.

0587 A new tree kangaroo from British New Guinea. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (8) **2**: 452–453.

0588 A new species of the Mascarene genus *Eliurus*. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (8) **2**: 453–454.

0589 A new *Pogonomys* presented to the British Museum by Sir William Ingram. *Annals and Magazine of Natural History; including Zoology Botany and Geology*, London (8) **2**: 495–496.

0590 A new *Akodon* from Tierra del Fuego. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (8) **2**: 496–497.

0591 The squirrels described as *Sciurus steeri* from Balabac and Palawan. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (8) **2**: 498.

0592 [On mammals collected in the Provinces of Shan-si and Shen-si, northern China, by Mr. M. P. Anderson, for the Duke of Bedford's zoological exploration of eastern Asia.] *Abstracts of the Proceedings of the Zoological Society of London* 15 December, No. 63: 44–45.

1909

0593 On mammals from Inkerman, north Queensland, presented to the National Museum by Sir William Ingram, Bt., and the Hon. John Forrest. *Proceedings of the Zoological Society of London* (1908): 788–794, pl. 43. [With G. Dollman].

0594 The Duke of Bedford's zoological exploration in eastern Asia.—XI. On mammals from the provinces of Shan-si and Shen-si, northern China. *Proceedings of the Zoological Society of London* (1908): 963–983.

0595 Some mammals from N.E. Kimberley, Northern Australia. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (8) **3**: 149–152.

0596 On mammals collected in Turkestan by Mr. Douglas Carruthers. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (8) **3**: 257–266.

0597 "On a collection of mammals from western Java, presented to the National Collection by Mr. W. E. Balston". *Abstracts of the Proceedings of the Zoological Society of London* 15 March, No. 68: 18–19. [With R. C. Wroughton].

0598 On the N. Australian rats referred to the genus *Mesembriomys*. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (8) **3**: 372–374.

0599 New species of *Paradoxurus* of the *P. philippinensis* group, and a new *Paguma*. *Annals and Magazine of Natural History, including Zoology, Botany and Geology*, London (8) **3**: 374–377.

0600 New species of *Oecomys* and *Marmosa* from Amazonia. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (8) **3**: 378–380.

0601 Two new macaques from western Java. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (8) **3**: 380–381. [With R. C. Wroughton].

0602 Diagnoses of new mammals collected by Mr. H. C. Robinson in the Malay Peninsula and Rhio Archipelago. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (8) **3**: 439–441. [With R. C. Wroughton].

0603 The generic arrangement of the African squirrels. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (8) **3**: 467–475.

0604 [Exhibition of specimens of a new rat which had been obtained by Mr. G. C. Shortridge during the Society's collecting expedition to Central America.] *Abstracts of the Proceedings of the Zoological Society of London* 15 June, No. 73: 32.

0605 New African small mammals in the British Museum collection. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (8) **4**: 98–112.

0606 A new gibbon from Annam. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (8) **4**: 112–113.

0607 On a collection of mammals from western Java presented to the National Museum by Mr. W. E. Balston. *Proceedings of the Zoological Society of London* 371–392. [With R. C. Wroughton].

0608 Two new mammals from northern Australia. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (8) **4**: 197–198.

0609 Notes on some South American mammals, with descriptions of new species. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (8) **4**: 230–242.

0610 A new rat from Guatemala. *Proceedings of the Zoological Society of London* 669–670.

0611 Four new African squirrels. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (8) **4**: 476–479.

0612 A collection of mammals from northern and central Mantchuria. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (8) **4**: 500–505.

0613 Diagnoses of new mammals collected by Mr. H. C. Robinson in the islands of the Straits of Malacca. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (8) **4**: 534–536. [With R. C. Wroughton].

0614 New African mammals. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (8) **4**: 542–549.

0615 On mammals from the Rhio Archipelago and Malay Peninsula collected by Messrs. H. C. Robinson, C. Boden Kloss, and E. Seimund, and presented to the National Museum by the Government of the Federated Malay States. *Journal of the Federated Malay States Museums* **4**: 99–129. [With R. C. Wroughton].

1910

0616 New African mammals. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (8) **5**: 83–92.

0617 Further new African mammals. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (8) **5**: 191–202.

0618 A collection of mammals from eastern Buenos Ayres, with descriptions of related new mammals from other localities. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (8) **5**: 239–247.

0619 Further New African Mammalia. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (8) **5**: 282–285.

0620 [Exhibition of the skin of a new potto from British East Africa.] *Abstracts of the Proceedings of the Zoological Society of London* 15 March, No. 81: 17.

0621 Ruwenzori Expedition reports – Mammalia. *Transactions of the Zoological Society of London* **19**: 481–518, pls. 30–34. [With R. C. Wroughton].

0622 A new Chinese mole of the genus *Scaptochirus*. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (8) **5**: 350–351.

0623 Three new West African mammals. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (8) **5**: 351–354

0624 New mammals from the East Indian Archipelago. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (8) **5**: 383–387.

0625 [Exhibition of a new monkey from the Malay Peninsula.] *Abstracts of the Proceedings of the Zoological Society of London* 19 April No. 83: 25.

0626 [Exhibition of a further consignment of mammals from China, collected by Mr. Malcolm Anderson for the Duke of Bedford's exploration of eastern Asia.] *Abstracts of the Proceedings of the Zoological Society of London* 19 April, No. 83: 25–26.

0627 Three new African rodents. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (8) **5**: 419–422.

0628 Two new mammals from the Malay Peninsula. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*. London (8) **5**: 424–426.

0629 Three new Asiatic mammals. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (8) **5**: 534–536.

0630 A new genus of fruit-bats and two new shrews from Africa. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (8) **6**: 111–114.

0631 Mammals from the River Supinaam, Demerara, presented by Mr. F. V. McConnell to the British Museum, *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (8) **6**: 184–189.

0632 Notes on African rodents. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (8) **6**: 221–224.

0633 A new potto from British East Africa. *Proceedings of the Zoological Society of London* 536–537.

0634 List of mammals from Mount Kilimanjaro, obtained by Mr. Robin Kemp, and presented to the British Museum by Mr. C. D. Rudd. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (8) **6**: 308–316.

0635 New African mammals in the British Museum. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (8) **6**: 426–432.

0636 A new monkey from the Malay Peninsula. *Proceedings of the Zoological Society of London* 634–635.

0637 A collection of small mammals from China. *Proceedings of the Zoological Society of London* 636–638.

0638 On mammals collected in Ceara, N.E. Brazil, by Fraulein Dr. Snethlage. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (8) **6**: 500–503.

0639 Four new South-American rodents. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (8) **6**: 503–506.

0640 New genera of Australasian Muridae. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (8) **6**: 506–508.

0641 The generic arrangement of the Australian murines hitherto referred to "*Mus*". *Annals and*

Magazine of Natural History; including Zoology, Botany and Geology, London (8) **6**: 603–607.

0642 New Australian Muridae of the genus *Pseudomys*. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (8) **6**: 607–610.

0643 A new genus for *Dactylopsila palpator*. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (8) **6**: 610.

0644 "The mammals of the Tenth Edition of Linnaeus: an attempt to fix the types of the genera and the exact bases and localities of the species." *Abstracts of the Proceedings of the Zoological Society of London* 13 December, No. 89: 50. [A preliminary version].

1911

0645 Three new South American mammals. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (8) **7**: 113–115.

0646 New Asiatic Muridae. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (8) **7**: 205–209.

0647 [On mammals collected in the Provinces of Kan-su and Sze-chuan, western China, by Mr. Malcolm Anderson, for the Duke of Bedford's exploration of eastern Asia. *Abstracts of the Proceedings of the Zoological Society of London* 7 February, No. 90: 3–5.

0648 The mammals of the Tenth Edition of Linnaeus; an attempt to fix the types of the genera and the exact bases and localities of the species. *Proceedings of the Zoological Society of London* 120–158.

0649 The Duke of Bedford's zoological exploration of eastern Asia.—XIII. On mammals from the provinces of Kan-su and Sze-chuan, western China. *Proceedings of the Zoological Society of London* 158–180.

0650 On new African Muridae. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (8) **7**: 378–383.

0651 A new vole from eastern Asia. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (8) **7**: 383–384.

0652 Three new mammals from Dutch New Guinea. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (8) **7**: 384–387.

0653 [On mammals collected in southern Shen-si, central China, by Mr. Malcolm P. Anderson, for the Duke of Bedford's exploration of eastern Asia.] *Abstracts of the Proceedings of the Zoological Society of London* 25 April, No. 95: 26–27.

0654 On mammals collected by the Rev. G. T. Fox in northern Nigeria. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (8) **7**: 457–463.

0655 New mammals from tropical South America. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (8) **7**: 513–517.

0656 A new murine genus and species from Sind, with diagnoses of three other new genera based on previously known species of "*Mus*". *Journal of the Bombay Natural History Society* **20**: 996–999a.

0657 Three new African rodents. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (8) **7**: 590–593.

0658 Three new mammals from the lower Amazons. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (8) **7**: 606–608.

0659 A new kangaroo from the Northern Territory of Western Australia. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (8) **7**: 609–610.

0660 List of small mammals obtained by Mr. G. Fenwick Owen on the Upper Gambia and in Fouta Djallon. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (8) **8**: 117–124.

0661 New rodents from S. America. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (8) **8**: 250–256.

0662 New African mammals. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (8) **8**: 375–378.

0663 Two new eastern bats. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (8) **8**: 378–380.

0664 The Duke of Bedford's zoological exploration of eastern Asia.—XIV. On mammals from

southern Shen-si, central China. *Proceedings of the Zoological Society of London* 687–695, pl. 21.

0665 [On *Talpa milleri* sp. n.]. [An unpaginated proof from the *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London, incorporated into Thomas' collected works and marked by him in manuscript as unpublished].

0666 [On mammals collected in the Provinces of Sze-chuan and Yunnan, western China, by Mr. Malcolm Anderson, for the Duke of Bedford's exploration of eastern Asia.] *Abstracts of the Proceedings of the Zoological Society of London* 24 October, No. 100: 48–50.

0667 Three new rodents from Kan-su. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (8) **8**: 720–723.

0668 Four new African carnivores. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (8) **8**: 724–726.

0669 New rodents from Sze-chuan collected by Capt. F. M. Bailey. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (8) **8**: 727–729.

0670 New mammals from central and western Asia, mostly collected by Mr. Douglas Carruthers. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (8) **8**: 758–762.

1912

0671 On small mammals from the Lower Amazon. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (8) **9**: 84–90.

0672 Notes on *Phascogale* and *Chaetocercus*. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (8) **9**: 91–92.

0673 Revised determinations of two Far-Eastern species of *Myospalax*. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (8) **9**: 93–95.

0674 A new genus of opossums and a new tuco-tuco. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (8) **9**: 239–241.

0675 XXVII.—Mammals of the Panyam Plateau, northern Nigeria.—II. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (8) **9**: 269–274.

0676 Two new Asiatic voles. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (8) **9**: 348–350.

0677 [Exhibition of the skull of a German wild boar from Buden and of a Hungarian wild boar from Kolozsvar.] *Abstracts of the Proceedings of the Zoological Society of London* 5 March, No. 105: 13–14.

0678 [Exhibition of the skin and skull of a viverrine carnivore from Tonkin.] *Abstracts of the Proceedings of the Zoological Society of London* 19 March, No. 106: 17–18.

0679 The Duke of Bedford's zoological exploration of eastern Asia.—XV. On mammals from the Provinces of Sze-chuan and Yunnan, western China. *Proceedings of the Zoological Society of London* 127–141.

0680 On mammals from central Asia, collected by Mr. Douglas Carruthers. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (8) **9**: 391–408.

0681 Three small mammals from S. America. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (8) **9**: 408–410.

0682 Descriptions of two giant rats from New Guinea, presented to the British Museum by the Hon. Walter Rothschild, F.R.S. *Novitates Zoologicae* **19**: 91–92.

0683 On insectivores and rodents collected by Mr. F. Kingdon Ward in N.W. Yunnan. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (8) **9**: 513–519.

0684 Eesthitisizm in speling with a ple for fienal l. *The Pioneer ov Simplified Speling* **1**: (3): 33–34. (May, 1912).

0685 List of a third collection of mammals from Panyam, N. Nigeria, presented by the Rev. G. T. Fox. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (8) **9**: 683–686.

0686 New species of *Crocidura* and *Petaurista* from Yunnan. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (8) **9**: 686–688.

0687 The races of the European wild swine. *Proceedings of the Zoological Society of London* 390–393.

0688 Two new genera and a new species of viverrine Carnivora. *Proceedings of the Zoological Society of London* 498–503, figs. 61–63.
0689 The generic names *Cercomys* and *Proechimys*. *Proceedings of the Biological Society of Washington* **25**: 115–116.
0690 The technical name of the Tasmanian Devil. *Proceedings of the Biological Society of Washington* **25**: 116.
0691 Mammals from the Ja river, Cameroons. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (8) **10**: 41–43.
0692 Small mammals from South America. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (8) **10**: 44–48.
0693 A new vespertilionine bat from Angola. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (8) **10**: 204–206.
0694 Two new species of *Nasua*. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (8) **10**: 228–230.
0695 Two new West-African mammals. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (8) **10**: 280–282.
0696 On a collection of small mammals from the Tsin-ling Mountains, central China, presented by Mr. G. Fenwick Owen to the National Museum. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (8) **10**: 395–403.
0697 New bats and rodents from South America. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (8) **10**: 403–411.
0698 Two new races of mongoose. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (8) **10**: 588–589.
0699 New *Centronycteris* and *Ctenomys* from S. America. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (8) **10**: 638–640.
0700 Simplifeid [sic] speling. *Evening Standard*, London 18 December.

1913

0701 Two new Australian mammals. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (8) **11**: 79–80.
0702 On some rare Amazonian mammals from the collection of the Para Museum. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (8) **11**: 130–136.
0703 On small mammals collected in Jujuy by Senor E. Budin. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (8) **11**: 136–143.
0704 On some specimens of *Glauconycteris* from the Cameroons. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (8) **11**: 144–145.
0705 Notes on South American Leporidae. (1) The small "tapeti" of Rio Janeiro [pp. 209–210]. (2) The hare of eastern Peru [pp. 210–211]. (3) The mountain hares of the *Sylvilagus andinus* group [pp. 212–214]. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (8) **11**: 209–214.
0706 Four new shrews. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (8) **11**: 214–218.
0707 Ernst Hartert's expedition to the central western Sahara. II. Mammals. *Novitates Zoologicae* **20**: 28–33.
0708 On African bats and shrews. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (8) **11**: 314–321.
0709 New forms of *Akodon* and *Phyllotis*, and a new genus for "*Akodon*" *teguina*. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (8) **11**: 404–409.
0710 [Exhibition of a specimen of the Amazonian monkey, *Callimico snethlageri*. *Proceedings of the Zoological Society of London* 3–4.
0711 On a remarkable new free-tailed bat from southern Bombay. *Journal of the Bombay Natural History Society* **22**: 87–91, 2 figs.
0712 A new shrew from the Andaman Islands. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (8) **11**: 468–469.

0713 New African *Epimys* and *Jaculus*. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (8) **11**: 482–485.

0714 On some mammals from Bali and Mysol, collected by Mr. E. Stresemann during the "Freiburger Molukken Expedition." *Annals and Magazine of Natural History, including Zoology, Botany and Geology*, London (8) **11**: 504–507.

0715 On certain of the smaller South American Cervidae. A. Broekets [pp. 585–588]. B. The Ecuadorean pudu (*Pudua mephistopheles*, de Wint.) [pp. 588–589]. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (8) **11**: 585–589.

0716 Some new Ferae from Asia and Africa. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (8) **12**: 88–92.

0717 On new mammals obtained by the Utakwa Expedition to Dutch New Guinea. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (8) **12**: 205–212.

0718 Some new species of *Uromys*. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (8) **12**: 212–217.

0719 A new genus of glossophagine bat from Colombia. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (8) **12**: 270–271.

0720 Scientific results from the Mammal Survey. IV. A new species of *Leggada* from Mysore. *Journal of the Bombay Natural History Society* **22**: 242. [With K. V. Ryley].

0721 The geographical races of the woolly opossum *(Philander laniger)*. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (8) **12**: 358–361.

0722 A new species of dwarf potto. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (8) **12**: 387–388.

0723 List of mammals obtained by the Hon W. Rothschild, Ernst Hartert and Carl Hilgert in western Algeria during 1913. *Novitates Zoologicae* **20**: 586–591.

0724 New mammals from South America. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (8) **12**: 567–574.

1914

0725 The tree shrews of the *Tupaia belangeri – chinensis* group. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (8) **13**: 243–245.

0726 On various South-American mammals. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (8) **13**: 345–363.

0727 Note on the genus *Leggada*. *Journal of the Bombay Natural History Society* **22**: 682.

0728 A new *Soriculus* from the Mishmi Hills. *Journal of the Bombay Natural History Society* **22**: 683–683a.

0729 On mammals from Manus Island, Admiralty Group, and Ruk Island, Bismarck Archipelago. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (8) **13**: 434–439.

0730 New Asiatic and Australasian bats and a new bandicoot. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (8) **13**: 439–444.

0731 New *Callicebus* and *Eumops* from South America. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (8) **13**: 480–481.

0732 "On a remarkable case of affinity between animals inhabiting Guiana, W. Africa, and the Malay Archipelago." *Abstracts of the Proceedings of the Zoological Society of London* 5 May, No. 133: 36. [A preliminary version].

0733 Nomina conservanda in Mammalia. *Zoologischer Anzeiger* **44**: 284–286.

0734 Rectification. *Zoologischer Anzeiger* **44**: 528. [Corrections to 0733].

0735 On small mammals from Djarkent, central Asia. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (8) **13**: 563–573.

0736 Three new S.-American mammals. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (8) **13**: 573–575.

0737 Report on the mammals collected by the British Ornithologists' Union Expedition and the Wollaston Expedition in Dutch New Guinea. *Transactions of the Zoological Society of London* **20**: 315–324.

0738 On a remarkable case of affinity between animals inhabiting Guiana, West Africa and the Malay Archipelago. *Proceedings of the Zoological Society of London* 415–417.

0739 Scientific results of the Mammal Survey. No. VII. [Notes on the mammals collected by Mr. G. C. Shortridge from Mount Popa and other parts of central Burma.] *Journal of the Bombay Natural History Society* **23**: 23–31.

0740 New *Nasua*, *Lutra*, and *Proechimys* from South America. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (8) **14**: 57–61.

0741 New South-American rodents. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (8) **14**: 240–244.

0742 A new genus of bats allied to *Nyctophilus*. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (8) **14**: 381–383.

0743 Four new small mammals from Venezuela. *Annals and Magazine of Natural History, including Zoology, Botany and Geology*, London (8) **14**: 410–414.

0744 Scientific results of the Mammal Survey. No. VIII. On Upper Burma squirrels referable to *Sciurus sladeni* and *haringtoni* [pp. 197–199]. A new *Leggadilla* from Kumaon [p. 200]. Notes on *Vandeleuria* [pp. 200–203]. Two new flying squirrels [pp. 204–205]. *Journal of the Bombay Natural History Society* **23**: 197–205.

0745 On small mammals collected in Tibet and the Mishmi Hills by Capt. F. M. Bailey. *Journal of the Bombay Natural History Society* **23**: 230–233.

0746 Second list of small mammals from western Yunnan collected by Mr. F. Kingdon Ward. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (8) **14**: 472–475.

1915

0747 Notes on *Emballonura*, with descriptions of new species. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (8) **15**: 137–140.

0748 Two new species of *Leuconoe*. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (8) **15**: 170–172.

0749 On bats of the genera *Nyctalus*, *Tylonycteris*, and *Pipistrellus*. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (8) **15**: 225–232.

0750 Scientific results of the Mammal Survey. No. IX. A new pipistrelle bat from Tenasserim [pp. 413–414]. A new murine genus and species from Ceylon [pp. 414–416]. *Journal of the Bombay Natural History Society* **23**: 413–416.

0751 An easily made ear-plug for soldiers in the firing line. *Land and Water*, London 13 February.

0752 A new shrew of the genus *Blarinella* from Upper Burma. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (8) **15**: 335–336.

0753 Determination of *Vesperugo vagans* Dobson from "Bermuda". *Proceedings of the Biological Society of Washington* **28**: 69.

0754 The generic name *Connochaetes* of Lichtenstein. *Proceedings of the Biological Society of Washington* **28**: 69.

0755 The penis bone or "baculum" as a guide to the classification of certain squirrels. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (8) **15**: 383–387.

0756 On some pteropine bats from Vulcan and Dampier Islands, off the N.E. coast of New Guinea. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (8) **15**: 387–389.

0757 The geographical races of *Citellus fulvus*. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (8) **15**: 421–424.

0758 Notes on the genus *Nyctophilus*. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (8) **15**: 493–499.

0759 On a minute shrew from Lake Baikal. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (8) **15**: 499–500.

0760 Scientific results from the Mammal Survey. No. X. A.—The Indian bats assigned to the genus *Myotis*. I. *Myotis* proper [pp. 607–610]. II. *Leuconoe* [pp. 610–612]. B.—Some notes on the viverrine genus *Hemigalus* [pp. 612–613a]. *Journal of the Bombay Natural History Society* **23**: 607–613a.

0761 On three new bats obtained by Mr. Willoughby Lowe in the Sudan. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (8) **15**: 559–562.

0762 Notes on bats of the genus *Coleura*. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (8) **15**: 576–579.

0763 Notes on the Asiatic bamboo rats (*Rhizomys*, etc.). *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (8) **16**: 56–61.

0764 On bats of the genus *Promops*. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (8) **16**: 61–64.

0765 New African rodents and insectivores, mostly collected by Dr. C. Christy for the Congo Museum. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (8) **16**: 146–152.

0766 Scientific results from the Mammal Survey. No. XI. A.—On pipistrelles of the genera *Pipistrellus* and *Scotozous* [pp. 29–34]. B.—The giant squirrels of Ceylon [pp. 34–37]. [With R. C. Wroughton]. C.—The Singhalese species of *Funambulus* [pp. 37–41]. [With R. C. Wroughton]. G.—A second species of *Coelomys* from Ceylon [pp. 49–50]. I.—On some specimens of *Vandeleuria* from Bengal, Bihar and Orissa [pp. 54–55]. K.—Notes on *Taphozous* and *Saccolaimus* [pp. 57–63]. *Journal of the Bombay Natural History Society* **24**: 29–41, 49–50, 54–55, 57–63.

0767 Richard Lydekker (1849–1915). [Obituary]. *Proceedings of the Royal Society of London* (B) **89**: iii–vi.

0768 A special genus for the Himalayan bat known as *Murina grisea*. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (8) **16**: 309–310.

0769 A new genus of phyllostome bat and a new *Rhipidomys* from Ecuador. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (8) **16**: 310–312.

0770 Further notes on Asiatic bamboo-rats. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (8) **16**: 313–317.

0771 A new bat from northern Nigeria. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (8) **16**: 447–448.

0772 *Phacochoerus* as the generic name of the warthogs. *Proceedings of the Biological Society of Washington* **28**: 181.

0773 List of mammals (exclusive of Ungulata) collected on the Upper Congo by Dr. Christy for the Congo Museum, Tervuren. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (8) **16**: 465–481.

1916

0774 The porcupine of Tenasserim and southern Siam. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (8) **17**: 136–139.

0775 On the grouping of the South-American Muridae that have been referred to *Phyllotis*, *Eumomys*, and *Eligmodontia*. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (8) **17**: 139–143.

0776 Scientific results from the Mammal Survey. No. XII. A.—On squirrels obtained in Burma by Messrs. Shortridge and Macmillan on the Chindwin River, Upper Burma [pp. 224–239, 1 pl.]. [With R. C. Wroughton]. B.—Notes on the genus *Cremnomys* [pp. 239–243]. *Journal of the Bombay Natural History Society* **24**: 224–243, 1 pl.

0777 A new marmot from Chitral. *Journal of the Bombay Natural History Society* **24**: 341–342.

0778 On the generic names of certain Old World monkeys. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (8) **17**: 179–181.

0779 Notes on Argentine, Patagonian and Cape Horn Muridae. [The mice of the *Hesperomys laucha* group pp. 182–185; The Cape Horn *Euneomys* pp. 185–186; The *Oryzomys* of the extreme south of South America pp. 186–187; The Cape Horn *Akodon* p. 187]. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (8) **17**: 182–187.

0780 [Exhibition of the scalp and frontlet with horns of a male sable antelope from the Luando River, Angola, which had been presented to the National Museum by Mr H. F. Varian, together with a female mask and horns.] *Abstracts of the Proceedings of the Zoological Society of London* 8 February, No. 151: 1–2.

0781 A new binturong from Siam. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (8) **17**: 270–271.

0782 A new genus for *Sciurus poensis* and its allies. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (8) **17**: 271–272.

0783 Notes on bats of the genus *Histiotus*. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (8) **17**: 272–276.

0784 A new sable antelope from Angola. *Proceedings of the Zoological Society of London* 298–301, 1 fig.

0785 The races of *Dremomys pernyi*. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (8) **17**: 391–394.

0786 A new rat from Tenasserim. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (8) **17**: 425.

0787 Note on the name *Corynorhinus megalotis*. *Proceedings of the Biological Society of Washington* **29**: 127.

0788 Scientific results from the Mammal Survey. No. XIII. A.—On Muridae from Darjiling and the Chin Hills. 1.—A new genus of giant rat from Sikkim [pp.404–407, 1 fig.]. 2.—A new rat allied to *Epimys sabanus*, from Darjiling [pp. 407–409, 1 fig.]. 3.—On the large rats allied to *Epimys bowersi* [pp. 409–412]. 4.—The rats of the *Epimys berdmorei* group [pp. 412–414]. 5.—A new mouse from Sikkim [pp. 414–415]. B.—Two new Indian bats [pp. 415–417]. C.—On squirrels of the genus *Dremomys* [pp. 417–418]. D.—The squirrels of the *Tomeutes lokroides* and *mearsi* groups [pp. 419–422]. [With R. C. Wroughton]. E.—A new flying squirrel from Tenasserim [pp. 422–423]. *Journal of the Bombay Natural History Society* **24**: 404–423, 2 figs.

0789 On the rats usually included in the genus *Arvicanthis*. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (8) **18**: 67–70.

0790 On *Rattus* as a generic name, with a note on the nomenclature of *Echimys* and *Loncheres*. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (8) **18**: 70–72.

0791 On the generic names applicable to the chevrotains (Tragulidae). *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (8) **18**: 72–73.

0792 On small mammals obtained in Sankuru, south Congo, by Mr. H. Wilson. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (8) **18**: 234–239.

0793 On the generic names *Rattus* and *Phyllomys*. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (8) **18**: 240.

0794 Three new African mice of the genus *Dendromus*. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (8) **18**: 241–242.

0795 List of Microchiroptera, other than leaf-nosed bats, in the collection of the Federated Malay States Museums. *Journal of the Federated Malay States Museums, Kuala Lumpur* **7**: 1–6.

0796 Some notes on the Echimyinae. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (8) **18**: 294–301.

0797 On the classification of the cavies. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (8) **18**: 301–303.

0798 Two new Argentine rodents, with a new subgenus of *Ctenomys*. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (8) **18**: 303–306.

0799 Two new species of *Akodon* from Argentina. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (8) **18**: 334–336.

0800 The grouping of the South American Muridae commonly referred to *Akodon*. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (8) **18**: 336–340.

0801 Scientific results from the Mammal Survey. No. XIV. (A) A new bat of the genus *Murina* from Darjiling [pp. 639–640]. (B) The bandicoot of Mount Popa, and its allies [pp. 640–643]. (C) On the rat known as *Epimys jerdoni* from Upper Burma [pp. 643–644]. *Journal of the Bombay Natural History Society* **24**: 639–644.

0802 A new bamboo rat from Perak. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (8) **18**: 445–446.

0803 Two new Muridae from South America. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (8) **18**: 478–480.

0804 [Note on *Anourosorex squamipes* and *assamensis*.] [p. 766]. In Wroughton, R. C., Bombay

Natural History Society's Mammal Survey of India, Burma and Ceylon. Report No. 25. [Chin Hills]. *Journal of the Bombay Natural History Society* **24**: 758–773.

1917

0805 Notes on the species of the genus *Cavia*. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (8) **19**: 152–160.

0806 A new bat of the genus *Scotaecus* [sic]. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (8) **19**: 280–281.

0807 A new species of *Aconaemys* [sic] from southern Chile. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (8) **19**: 281–282.

0808 Some notes on three-toed sloths. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (8) **19**: 352–357.

0809 Preliminary diagnoses of new mammals obtained by the Yale – National Geographic Society Peruvian Expedition. *Smithsonian Miscellaneous Collections* **68**: (4), (Publication 2447) : 1–3.

0810 A new vole from Palestine. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (8) **19**: 450–451.

0811 On the small hamsters that have been referred to *Cricetulus phaeus* and *campbelli*. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (8) **19**: 452–457.

0812 The grey squirrel in England. *Field*, London **129**, (3357): 625.

0813 P – L – I – G. *The Pyoneer* 27.

0814 The geographical races of *Galago crassicaudatus*. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (8) **20**: 47–50.

0815 On small mammals from the delta of the Parana. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (8) **20**: 95–100.

0816 On the arrangement of the South American rats allied to *Oryzomys* and *Rhipidomys*. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (8) **20**: 192–198.

0817 Two new rats of the *Rattus confucianus* group. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (8) **20**: 198–200.

0818 A new agouti from the Moon Mountains, southern British Guiana. *Annals and Magazine of Natural History, including Zoology, Botany and Geology*, London (8) **20**: 259–261.

0819 A new mink-like *Mustela* from Java. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (8) **20**: 261–262. [With H. C. Robinson].

0820 Scientific results from the Mammal Survey. No. XVI. (A)—The tupaias of south Tenasserim [pp. 199–201]. (B)—Notes on *Millardia* and its allies [pp. 201–203]. (C)—A new genus of Muridae [pp. 203–205]. (C)—The spiny mouse of Sind [pp. 205–206]. *Journal of the Bombay Natural History Society* **25**: 199–206.

0821 Notes on agoutis, with descriptions of new forms. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (8) **20**: 310–313.

0822 A new *Heliophobius* from north-eastern Rhodesia. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (8) **20**: 314–315.

0823 The *Spalax* of the Grecian Archipelago. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (8) **20**: 315–317.

0824 A new rat of the genus *Mylomys* from the Upper Nile. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (8) **20**: 362–363.

0825 Notes on *Georychus* and its allies. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (8) **20**: 441–444.

0826 On the allocation of the name *Sciurus finlaysoni*, Horsfield. *Journal of the Natural History Society of Siam* **2**: 343–346.

1918

0827 On the striped squirrels hitherto referred to the genus *Paraxerus*. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (9) **1**: 33–38.

0828 Two new tuco-tucos from Argentina. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (9) **1**: 38–40.

0829 The nomenclature of the geographical forms of the Panolia deer (*Rucervus eldi* and its relatives). *Journal of the Bombay Natural History Society* **25**: 363–367.
0830 A selection of lectotypes of Indian mammals, from the co-types described by Hodgson, Gray, Elliot and others. *Journal of the Bombay Natural History Society* **25**: 368–372.
0831 On small mammals from Salta and Jujuy collected by Mr. E. Budin. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (9) **1**: 186–193.
0832 The generic division of the hedgehogs. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (9) **1**: 193–196.
0833 Four new species of hedgehog. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (9) **1**: 230–233.
0834 Some notes on the small sand-foxes of North Africa. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (9) **1**: 242–245.
0835 On the arrangement of the small Tenrecidae hitherto referred to *Oryzoryctes* and *Microgale*. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (9) **1**: 302–307.
0836 Moles and mosses. *Notes to Exeter Natural History Society*.
0837 Notes on *Petrodromus* and *Rhynchocyon*. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (9) **1**: 364–370.
0838 A new wild dog from the Bogota Cordillera. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (9) **1**: 370–371.
0839 New forms of *Dendromus, Dipodillus*, and *Gerbillus*. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (9) **2**: 59–64.
0840 New species of *Gerbillus* and *Taterillus*. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (9) **2**: 146–151.
0841 A new duiker from Zanzibar. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (9) **2**: 151–152.
0842 A revised classification of the Otomyinae, with descriptions of new genera and species. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (9) **2**: 203–211.
0843 The hedgehog of Palestine and Asia Minor. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (9) **2**: 211–213.
0844 Rule of footpath and road. 'Our Post Bag' *Express and Echo* [Exeter local paper], October.
0845 A new species of *Elgmodontia* from Catamarca. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (9) **2**: 482–484.
0846 Two new forms of *Leggada*. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (9) **2**: 484–486.
0847 Natural history collections made by the late Major H. S. Toppin. Description of the new monkey. *Peru–Bolivia Boundary Commission, Appendix* : 9–10, 1 pl. [Repeated from 0731].
0848 North Sea fisheries. *The Times*, London, December.

1919

0849 On some small mammals from Catamarca. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (9) **3**: 115–118.
0850 The white-toothed shrew of Palestine. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (9) **3**: 199.
0851 On small mammals collected by Senor E. Budin in north-western Patagonia. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (9) **3**: 199–212.
0852 Two new Argentine species of *Akodon*. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (9) **3**: 213–214.
0853 Notes on gerbils referred to the genus *Meriones*, with descriptions of new species and subspecies. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (9) **3**: 263–273.
0854 On small mammals from "Otro Cerro", north-eastern Rioja, collected by Sr. E. Budin [north-eastern Rioja deleted from copy in Thomas' collected works, Catamarca substituted in manuscript by Thomas]. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (9) **3**: 489–500.

0855 Scientific results from the Mammal Survey. No. XIX. A synopsis of the groups of true mice found within the Indian Empire. *Journal of the Bombay Natural History Society* **26**: 417–421.

0856 A new species of *Nesokia* from Mesopotamia. *Journal of the Bombay Natural History Society* **26**: 422–423.

0857 Two new gerbils from Sinai. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (9) **3**: 559–560.

0858 On a small collection of mammals from Lumbo, Mozambique. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (9) **4**: 29–34.

0859 A new species of *Euneomys* from Patagonia. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (9) **4**: 127–128.

0860 List of mammals from the highlands of Jujuy, north Argentina, collected by Sr. E. Budin. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (9) **4**: 128–135.

0861 Two new rodents from Tartagal, Salta, N. Argentina. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (9) **4**: 154–156.

0862 The method of taking the incisive index in rodents. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (9) **4**: 289–290, 1 fig.

0863 Scientific results from the Mammal Survey. No. XX. A.—Notes on the genus *Cheliones*. *Journal of the Bombay Natural History Society* **26**: 726–727.

0864 Some new mammals from Mesopotamia. *Journal of the Bombay Natural History Society* **26**: 745–749.

0865 The types of the mammals described by M. Fernand Lataste. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (9) **4**: 349–354.

1920

0866 Two new species of *Sylvilagus* from Colombia. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (9) **5**: 31–33.

0867 A new shrew and two new foxes from Asia Minor and Palestine. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (9) **5**: 119–122.

0868 The generic positions of *"Mus" nigricauda*, Thomas, and *woosnami*, Schwann. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (9) **5**: 140–142.

0869 A new *Taphozous* from the Sudan. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (9) **5**: 142–144.

0870 A new marmoset from the Peruvian Amazons. *Annals and Magazine of Natural History including Zoology, Botany and Geology*, London (9) **5**: 144.

0871 Scientific results from the Mammal Survey. No. XXI. A.—Some new mammals from Baluchistan and northwest India [pp. 933–938]. B.—Two new species of *Calomyscus* [pp. 938–940]. *Journal of the Bombay Natural History Society* **26**: 933–940.

0872 Some notes on *Babirussa*. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (9) **5**: 185–188.

0873 A further collection of mammals from Jujuy. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (9) **5**: 188–196.

0874 Two new Asiatic bats of the genera *Tadarida* and *Dyacopterus*. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (9) **5**: 283–285.

0875 Four new squirrels of the genus *Tamiops*. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (9) **5**: 304–308.

0876 On Neotropical bats of the genus *Eptesicus*. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (9) **5**: 360–367.

0877 On the group of African zorils represented by *Ictonyx libyca* [altered to *libycus* in manuscript by Thomas in his collected works]. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (9) **5**: 367–369.

0878 New species of *Reithrodon*, *Abrocoma*, and *Scapteromys* from Argentina. A. A further collection from Sr. Budin [pp. 473–477]. B. The *Scapteromys* of the Parana Delta [pp. 477–478]. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (9) **5**: 473–478.

0879 A new fat-tailed gerbil (*Pachyuromys*) from western Algeria. *Novitates Zoologicae* **27**: 313–314.

0880 Captain Angus Buchanan's Air Expedition. I. On a series of small mammals from Kano. *Novitates Zoologicae* **27**: 315–320.

0881 *Notoryctes* in north-west Australia. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (9) **6**: 111–113. [With M. A. C. Hinton].

0882 A new genus of Echimyinae. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (9) **6**: 113–115.

0883 On mammals from near Tinogasta, Catamarca, collected by Sr. Budin. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (9) **6**: 116–120.

0884 Scientific results from the Mammal Survey. No. XXII. A.—A new bat of the genus *Rhinopoma* from southeast Persia. *Journal of the Bombay Natural History Society* **27**: 25.

0885 A new tuco-tuco from Tucuman. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (9) **6**: 243–244.

0886 On mammals from the Lower Amazons in the Goeldi Museum, Para. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (9) **6**: 266–283.

0887 On small mammals from the Famatina Chain, north-western Rioja. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (9) **6**: 417–422.

0888 On mammals from Ceram. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (9) **6**: 422–431.

0889 A note on the type locality and geographical races of the gundi (*Ctenodactylus gundi* Rothm.). *Novitates Zoologicae* **27**: 506–507.

0890 New small mammals from New Guinea. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (9) **6**: 533–537.

0891 Scientific results from the Mammal Survey. No. XXIII. A new bat of the genus *Myotis* from Sikkim. *Journal of the Bombay Natural History Society* **27**: 248–250.

0892 Report on the Mammalia collected by Mr. Edmund Heller during the Peruvian expedition of 1915 under the auspices of Yale University and the National Geographic Society. *Proceedings of the United States National Museum*, Washington **58**: 217–249, pl. 14–15.

1921

0893 Some new insular squirrels of the *Callosciurus caniceps – concolor* group from Peninsular Siam. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (9) **7**: 118–123. [With H. C. Robinson].

0894 A new tuco-tuco from Bolivia. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (9) **7**: 136–137.

0895 Two new Muridae discovered in Paraguay by the Marquis de Wavrin. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (9) **7**: 177–179.

0896 A new mountain vizcacha (*Lagidium*) from N.W. Patagonia. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (9) **7**: 179–181.

0897 A new monkey and a new squirrel from the Middle Mekong, on the eastern frontier of Siam. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (9) **7**: 181–183.

0898 New *Rhipidomys*, *Akodon*, *Ctenomys*, and *Marmosa* from the Sierra Santa Barbara, S.E. Jujuy. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (9) **7**: 183–187.

0899 On a new genus and species of shrew, and some new Muridae from the East-Indian Archipelago. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (9) **7**: 243–249.

0900 [A new vole from Shiraz.] [pp. 580–581]. In Cheesman, R. E., Report on a collection of mammals made by Col. J. E. B. Hotson in Shiraz, Persia. *Journal of the Bombay Natural History Society* **27**: 573–581.

0901 On small mammals from the Kachin Province, northern Burma. *Journal of the Bombay Natural History Society* **27**: 499–505.

0902 Scientific results from the Mammal Survey. No. XXV. (A). On jungle mice from Assam

[pp. 596–598]. (B). The brush-tailed porcupine of Assam [pp. 598–599]. *Journal of the Bombay Natural History Society* **27**: 596–599.

0903 New foxes of the genera *Cerdocyon* and *Pseudalopex* from northern Argentina. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (9) **7**: 381–385.

0904 On cavies of the genus *Caviella*. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (9) **7**: 445–448.

0905 New *Sigmodon, Oryzomys*, and *Echimys* from Ecuador. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (9) **7**: 448–450.

0906 Captain Angus Buchanan's Air Expedition. II. On the mammals (other than ruminants) obtained during the expedition to Air (Asben). *Novitates Zoologicae* **28**: 1–13. [With M. A. C. Hinton].

0907 Three new species of *Marmosa*, with a note on *Didelphys waterhousei*, Tomes. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (9) **7**: 519–523.

0908 The tuco-tuco of San Juan, Argentina. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (9) **7**: 523–524.

0909 The *Arctonyx* of Annam. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (9) **7**: 524.

0910 *Choiropotamus* versus *Koiropotamus*. *Proceedings of the Biological Society of Washington* **34**: 135.

0911 The geographical races of *Herpestes brachyurus* Gray. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (9) **8**: 134–136.

0912 A new genus of opossum from southern Patagonia. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (9) **8**: 136–139.

0913 A new bat of the genus *Promops* from Peru. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (9) **8**: 139.

0914 On spiny rats of the *Proechimys* group from southeastern Brazil. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (9) **8**: 140–143.

0915 Scientific results from the Mammal Survey. XXVII. The geographical races of *Scotomanes ornatus*. *Journal of the Bombay Natural History Society* **27**: 772–773.

0916 The "Huron" of the Argentine. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (9) **8**: 212–213.

0917 On mammals from the Province of San Juan, western Argentina. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (9) **8**: 214–221.

0918 Two new Argentine forms of skunk. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (9) **8**: 221–222.

0919 New *Cryptotis, Thomasomys*, and *Oryzomys* from Colombia. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (9) **8**: 354–357.

0920 New *Pseudochirus* and *Phascogale* from N.W. New Guinea. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (9) **8**: 357–359.

0921 Notes on Australasian rats, with a selection of lectotypes of Australasian Muridae. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (9) **8**: 425–433.

0922 The jerboa of Muscat. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (9) **8**: 440–441.

0923 A new short-tailed opossum from Brazil. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (9) **8**: 441–442.

0924 A new cotton-tail (*Sylvilagus*) from Colombia. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (9) **8**: 442–443.

0925 Notes on the species of *Notomys*, the Australian jerboa-rats. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (9) **8**: 536–541.

0926 A new hedgehog from the island of Djerba, Tunis. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (9) **8**: 570.

0927 On a further collection of mammals from Jujuy obtained by Sr. Budin. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (9) **8**: 608–617.

0928 The masked civets (*Paguma*) of western China. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (9) **8**: 617–618.
0929 On three new Australian rats. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (9) **8**: 618–622.
0930 New *Hesperomys* and *Galea* from Bolivia. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (9) **8**: 622–624.
0931 Two new species of slow-loris. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (9) **8**: 627–628.
0932 Scientific results from the Mammal survey. No. XXX. The mungooses of the *Herpestes smithii* group. *Journal of the Bombay Natural History Society* **28**: 23–26.
0933 Scientific results from the Mammal Survey. No. XXXI. Two new rats from Assam. *Journal of the Bombay Natural History Society* **28**: 26–27.
0934 A new Arabian hare. *Journal of the Bombay Natural History Society* **28**: 28–29.
0935 On a collection of rats and shrews from the Dutch East Indian Islands. *Treubia*, Buitenzorg **2**: 109–114.

1922

0936 On some interesting hedgehogs from the Persian Gulf. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (9) **9**: 142–144.
0937 The mammals of the 1921 Mount Everest Expedition. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (9) **9**: 178–186. [With M. A. C. Hinton].
0938 On some new forms of *Ochotona*. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (9) **9**: 187–193.
0939 Some notes on ferret-badgers. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (9) **9**: 193–196.
0940 On the systematic arrangement of the marmosets. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (9) **9**: 196–199.
0941 A subdivision of the genus *Uromys*. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (9) **9**: 260–261.
0942 New mammals from New Guinea and neighbouring islands. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (9) **9**: 261–265.
0943 A new marmoset from the Lower Amazons. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (9) **9**: 265–266.
0944 The generic classification of the *Taphozous* group. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (9) **9**: 266–267.
0945 Scientific results from the Mammal Survey. No. XXXII. (A) New and interesting mammals from the Mishmi Hills [pp. 428–431]. (B) The porcupine of Assam [pp. 431–432]. (C) A new forest badger (*Helictis*) from the Naga Hills [p. 432]. *Journal of the Bombay Natural History Society* **28**: 428–432.
0946 Note on the nomenclature of the northern slow loris. *Journal of the Bombay Natural History Society* **28**: 433.
0947 The forms of *Jaculus jaculus* in Egypt and Syria. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (9) **9**: 295–297.
0948 Two new jerboa-rats (*Notomys*). *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (9) **9**: 315–317.
0949 On the animals known as "Ground-hogs" or "Cane-rats" in Africa. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (9) **9**: 389–392.
0950 On mammals collected by C. Keysser in the Saruwaged and Rawlinson Mountains region of N.E. New Guinea. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (9) **9**: 669–676.
0951 The generic name of the finless-backed porpoise, formerly known as *Neomeris phocaenoides*. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (9) **9**: 676–677.
0952 The bandicoots of Nuyts Archipelago, S. Australia, and of Cape York, N. Queensland. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (9) **9**: 677–679.

0953 Two new subspecies of *Phalanger orientalis*. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (9) **9**: 679–680.

0954 A new rock-wallaby (*Petrogale*) from the islands off South Australia. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (9) **9**: 681–683.

0955 A selection of lectotypes of the typical Australian marsupials in the British Museum collection. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (9) **10**: 127–128.

0956 On a new subspecies of *Zaglossus*, with remarks on other species of the genus. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (9) **10**: 129–131. [With Lord Rothschild.]

0957 On bandicoots allied to *Perameles bougainvillei*. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (9) **10**: 143–145.

0958 On mammals from New Guinea obtained by the Dutch Scientific Expeditions of recent years. *Nova Guinea* **13**: 723–740.

0959 A new hedgehog from Aden. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (9) **10**: 307–308.

0960 On mammals from the Yunnan highlands collected by Mr. George Forrest and presented to the British Museum by Col. Stephenson R. Clarke, D.S.O. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (9) **10**: 391–406.

0961 A new species of *Mastacomys* from a cave in South Australia. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (9) **10**: 550–551.

0962 A new jird (*Meriones*) from southern Palestine. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (9) **10**: 552–553.

0963 A new bat of the genus *Miniopterus* from northern Australia. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (9) **10**: 616–617.

0964 Scientific results from the Mammal Survey. No. XXXV. Two new rodents from the Mergui Archipelago. *Journal of the Bombay Natural History Society* **28**: 1067–1068.

1923

0965 The Godman Exploration Fund: List of mammals from north Queensland collected by Mr. T. V. Sherrin. *Annals and Magazine of Natural History; including Zoology; Botany and Geology*, London (9) **11**: 170–178.

0966 [Exhibition of a new rock-kangaroo from north Queensland.] *Abstracts of the Proceedings of the Zoological Society of London* 13 February, No. 235: 13.

0967 [Exhibition of the skull of a pygmy fruit-bat from Sumatra.] *Abstracts of the Proceedings of the Zoological Society of London* 13 February, No. 235: 14.

0968 On some Queensland Phalangeridae. [The Taguan flying-phalangers pp. 246–249; A new *Pseudochirus* from N. Queensland pp. 249–250; The rock *Pseudochirus* of the Northern Territory p. 250. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (9) **11**: 246–250.

0969 On some small mammals, chiefly bats, from the East Indian Archipelago. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (9) **11**: 250–255.

0970 [Letter objecting to possible entrance fees to public institutions, notably the British Museum (Natural History), with reasons]. *The Times*, London 19 March.

0971 Some new African squirrels. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (9) **11**: 518–523.

0972 The West African forms of *Heliosciurus rufobrachium*. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (9) **11**: 523–526.

0973 New subspecies of *Protoxerus stangeri*, the giant squirrel of Equatorial Africa. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (9) **11**: 527–529.

0974 The geographical races of *Lutreolina crassicaudata*. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (9) **11**: 583–585.

0975 The native rat of Pearson's Islands, S. Australia. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (9) **11**: 601–602.

0976 New subspecies of *Metachirus*. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (9) **11**: 602–607.

0977 Two new guenons from the Ivory Coast, West Africa. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (9) **11**: 607–608.

0978 On mammals from the Li-kiang Range, Yunnan, being a further collection obtained by Mr. George Forrest. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (9) **11**: 655–663.

0979 Exhibition of a new rock kangaroo from north Queensland. *Proceedings of the Zoological Society of London* 177.

0980 Exhibition of the skull of a pygmy fruit-bat from Sumatra. *Proceedings of the Zoological Society of London* 178.

0981 On the mammals obtained in Darfur by the Lynes–Lowe Expedition. *Proceedings of the Zoological Society of London* 247–271. [With M. A. C. Hinton].

0982 Scientific results from the Mammal Survey. No. XXXVII. On tree shrews from the Mergui Archipelago. *Journal of the Bombay Natural History Society* **29**: 84.

0983 Scientific results from the Mammal Survey. No. XXXVIII. The mouse deer (*Tragulus*) of the Mergui Archipelago. *Journal of the Bombay Natural History Society* **29**: 84–85.

0984 Scientific results from the Mammal Survey. No. XXXIX. On the large squirrels of the *Ratufa gigantea* group. *Journal of the Bombay Natural History Society* **29**: 85–86.

0985 Scientific results from the Mammal Survey. No. XL. A new mouse from Madura, S. India. *Journal of the Bombay Natural History Society* **29**: 87.

0986 Scientific results from the Mammal Survey. No. XLI. On the forms contained in the genus *Harpiocephalus*. *Journal of the Bombay Natural History Society* **29**: 88–89.

0987 A new short-tailed opossum from Marajo, Amazonia. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (9) **12**: 157.

0988 On the ring-tailed phalanger of South Australia, and a new rat from north Queensland. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (9) **12**: 158–160.

0989 Geographical races of *Petaurista alborufus*. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (9) **12**: 171–172.

0990 Notes on some spiny mice *(Acomys)*. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (9) **12**: 173–174.

0991 A new *Uromys* from the Kei Islands. *Treubia*, Buitenzorg **3**: 442.

0992 Scientific results from the Mammal Survey. No. XLII. The distribution and geographical races of the Gulandi bush rats (*Golunda ellioti*). *Journal of the Bombay Natural History Society* **29**: 373–376.

0993 Scientific results from the Mammal Survey. No. 43. On some squirrels from the Mergui Archipelago. *Journal of the Bombay Natural History Society* **29**: 376–377.

0994 A new ratel from British East Africa. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (9) **12**: 340.

0995 Two new mammals from Marajo Island. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (9) **12**: 341–342.

0996 On mammals collected by Captain Shortridge during the Percy Sladen and Kaffrarian Museum Expedition to the Orange River. *Proceedings of the Zoological Society of London* 483–499. [With M. A. C. Hinton].

0997 On some mammals from Simalur Island, west of Sumatra, collected by Mr. E. Jacobson. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (9) **12**: 591–593.

0998 Three new mammals from Peru. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (9) **12**: 692–694.

1924

0999 A new pika from the Altai. *Annals and Magazine of Natural History; including Zoology; Botany and Geology*, London (9) **13**: 163–164.

1000 On a fish-eating rat from Bogota. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (9) **13**: 164–165.

1001 New South American small mammals. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (9) **13**: 234–237.

1002 Some notes on pacas. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (9) **13**: 237–239.

1003 On some Ceylon mammals. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (9) **13**: 239–242.

1004 Some new Australasian Muridae. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (9) **13**: 296–299.

1005 Starvation for influenza. *Truth* 5 March.

1006 Scientific results from the Mammal Survey. No. XLIV. On a new field mouse from Nepal, with a note on the classification of the genus *Apodemus*. *Journal of the Bombay Natural History Society* **29**: 888–889.

1007 On a collection of mammals made by Mr. Latham Rutter in the Peruvian Amazons. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (9) **13**: 530–538.

1008 A new *Scoteinus* from Queensland. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (9) **13**: 540.

1009 A new fish-eating rat from Ecuador. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (9) **13**: 541–542.

1010 A new short-tailed opossum from Ecuador. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (9) **13**: 586.

1011 The geographical races of *Oryzomys ratticeps*. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (9) **14**: 143–144.

1012 Nomina conservanda in Mammalia. *Proceedings of the Zoological Society of London* 345–348. [With 25 other European mammalogists].

1013 New *Callicebus*, *Conepatus*, and *Oecomys* from Peru. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (9) **14**: 286–288.

1014 A new subspecies of *Nyctinomus australis*. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (9) **14**: 455–456.

1015 A new genus and species of shrew from Ceylon. *Spolia Zeylanica* (*Ceylon Journal of Science*, B), Colombo **13** (1) : 93–95.

1016 A new pouched mouse (*Phascogale*) from northern New South Wales. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (9) **14**: 528–529.

1017 On learning Braille. *The Times*, London 21 November.

1925

1018 A new genus of cavy from Catamarca. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (9) **15**: 418–420.

1019 On mammals collected in 1923 by Captain G. C. Shortridge during the Percy Sladen and Kaffrarian Museum Expedition to Southwest Africa. With field notes by the collector. *Proceedings of the Zoological Society of London* 221–246. [With M. A. C. Hinton].

1020 The Spedan Lewis South American Exploration.—I. On mammals from southern Bolivia. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (9) **15**: 575–582.

1021 On some Argentine mammals. I. Two new rodents from Tucuman Province [pp. 582–584.] II. A special genus for *Eunemomys fossor* [pp. 584–585]. III. A second species of *Spalacopus* [pp. 585–586]. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (9) **15**: 582–586.

1022 A new genus of African Muridae allied to *Leggada*. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (9) **15**: 667–669.

1023 A new Australian mouse of the genus *Pseudomys*. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (9) **15**: 669–671.

1024 On the mammals (other than ruminants) collected by Captain Angus Buchanan during his second Saharan expedition, and presented by him to the National Museum. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (9) **16**: 187–197.

1025 On some of the species of *Psammomys* found in Algeria, Tunis and Tripoli. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (9) **16**: 197–199.

1026 On some mammals from the New Hebrides. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (9) **16**: 240–241.

1027 The mammals obtained by Mr. Herbert Stevens on the Sladen–Godman Expedition to Tonkin. *Proceedings of the Zoological Society of London* 495–506.

1028 The garden dormouse of Formentera, Balearic Islands. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (9) **16**: 389–390.

1029 The generic position of *Gerbillus przewalskii* Buchner. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (9) **16**: 548.

1030 The generic name of the finless-backed porpoise. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (9) **16**: 655.

1926

1031 The generic position of certain African Muridae, hitherto referred to *Aethomys* and *Praomys*. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (9) **17**: 174–179.

1032 Some new African Mammalia. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (9) **17**: 180–184.

1033 Two new rock-wallabies (*Petrogale*) discovered by Captain G. W. [sic, G. H.] Wilkins in northern Australia. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (9) **17**: 184–187.

1034 A ready method of repairing small mammal skulls. *Museums Journal*, London **25**: 209.

1035 On some small mammals from Madagascar. [The races of *Ericulus setosus* pp. 250–251; Two new species of *Microgale* pp. 251–252]. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (9) **17**: 250–252.

1036 On mammals from Gorgona Island, with the description of a new sloth. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (9) **17**: 309–311.

1037 Two new mammals from north Argentina. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (9) **17**: 311–313.

1038 The Godman–Thomas Expedition to Peru.—I. On mammals collected by Mr. R. W. Hendee near Lake Junin. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (9) **17**: 313–318.

1039 The Spedan Lewis South American Exploration.—II. On mammals collected in the Tarija Department, southern Bolivia. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (9) **17**: 318–328.

1040 On mammals from Ovamboland and the Cunene River, obtained during Captain Shortridge's third Percy Sladen and Kaffrarian Museum Expedition into South-west Africa. *Proceedings of the Zoological Society of London* 285–312.

1041 The Spedan Lewis South American Exploration.—III. On mammals collected by Sr. Budin in the Province of Tucuman. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (9) **17**: 602–609.

1042 A new *Myotis* from Ladak. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (9) **17**: 609–610.

1043 The Godman–Thomas Expedition to Peru.—II. On mammals collected by Mr. R. W. Hendee in north Peru between Pacasmayo and Chachapoyas. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (9) **17**: 610–616.

1044 On various mammals obtained during Capt. Wilkin's expedition in Australia. [On rock-wallabies of the *Petrogale penicillata – assimilis* group pp. 625–630; *Peradorcas* pp. 630–631; *Pseudochirus* pp. 631–633; *Trichosurus* pp. 633–635]. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (9) **17**: 625–635.

1045 On some mammals from the Middle Amazons. [The giant Amazonian squirrels of the subgenus *Urosciurus* pp. 635–637; The acouchis of the *Myoprocta pratti* group pp. 637–639]. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (9) **17**: 635–639.

1046 Two new subspecies of *Callosciurus quinquestriatus*. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (9) **17**: 639–641.

1047 The Godman–Thomas Expedition to Peru.—III. On mammals collected by Mr. R. W. Hendee in the Chachapoyas region of north Peru. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (9) **18**: 156–167.

1048 The Spedan Lewis South American Exploration.—IV. List of mammals obtained by Sr. Budin on the boundary between Jujuy and Bolivia. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (9) **18**: 193–195.

1049 Scientific results from the Mammal Survey. No. XLV. Two new pygmy squirrels from the Mergui Archipelago. *Journal of the Bombay Natural History Society* **31**: 22.

1050 A new long-eared bat from central Asia. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (9) **18**: 306–307.

1051 Two new Australian Muridae. [A new insular rat from Western Australia pp. 308–309; A rat from Moreton Island, S.E. Queensland pp. 309–310]. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (9) **18**: 308–310.

1052 The zoological names *Simia*, *S. satyrus*, and *Pithecus*, and their possible suppression. *Nature*, London **118** (2968): 411. [With M. A. C. Hinton].

1053 The Godman–Thomas Expedition to Peru.—IV. On mammals collected by Mr. R. W. Hendee north of Chachopoyas, Province of Amazonas, north Peru. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (9) **18**: 345–349. [With J. St. Leger].

1054 The local races of *Dasyrus hallucatus*. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (9) **18**: 543–544.

1055 The Spedan Lewis South American Exploration.—V. Mammals obtained by Senor E. Budin in Neuquen. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (9) **18**: 635–641. [With J. St. Leger].

1927

1056 A remarkable new monkey from Peru. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (9) **19**: 156–157.

1057 The Godman–Thomas Expedition to Peru.—V. On mammals collected by Mr. R. W. Hendee in the Province of San Martin, N. Peru, mostly at Yurac Yacu. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (9) **19**: 361–375.

1058 On the Titi monkeys of the *Callicebus torquatus* group. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (9) **19**: 509–510.

1059 The Delacour Exploration of French Indo-China – Mammals. *Proceedings of the Zoological Society of London* 41–58, pls. 1–2.

1060 A selection of lectotypes of American rodents in the collection of the British Museum. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (9) **19**: 545–554

1061 A new bat of the genus *Myotis* from Abyssinia. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (9) **19**: 554–555.

1062 The octodon of the highlands near Santiago. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (9) **19**: 556–557.

1063 On a further collection of mammals made by Sr. E. Budin in Neuquen, Patagonia. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (9) **19**: 650–658.

1064 A new subspecies of *Bassaricyon* from Colombia. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (9) **20**: 80.

1065 On mammals from the Gobabis district, eastern Damaraland, South-West Africa, obtained during Captain Shortridge's fourth Percy Sladen and Kaffrarian Museum Expedition. With field notes by the collector. *Proceedings of the Zoological Society of London* 371–398.

1066 On further Patagonian mammals from Neuquen and the Rio Colorado collected by Senor E. Budin. A.—Neuquen [pp. 200–202]. B.—Pichi Mahuida [pp. 202–205]. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (9) **20**: 199–205.

1067 Scientific results from the Mammal Survey. No. XLVII. On the generic position of the Afghan jerboa (*Alactaga indica*). *Journal of the Bombay Natural History Society* **31**: 22.
1068 On further monkeys of the *Callicebus torquatus* group. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (9) **20**. 287.
1069 On Bornean specimens of the teledu (*Mydaus*). *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (9) **20**: 288.
1070 The Godman–Thomas Expedition to Peru.—VI. On mammals from the Upper Huallaga and neighbouring highlands. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (9) **20**: 594–608.
1071 The late Sir Harry Johnston. *Nature*, London **120**: 339.
1072 A new genus and species of glossophagine bat, with a subdivision of the genus *Choeronycteris*. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (10) **1**: 120–123.
1073 A new *Thomasomys* from the Rio Grande de Sul. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (10) **1**: 154–155.
1074 Some rarities from Abyssinia, with the description of a new mole-rat (*Tachyoryctes*) and a new *Arvicanthis*. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (10) **1**: 302–304.
1075 A special proodont race of water-vole, occurring in Northumbria. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (10) **1**: 316–318.
1076 The Transvaal race of the common S.-African wild cat. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (10) **1**: 318–319.
1077 On the East-African mungoose described as *Galeriscus jacksoni*. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (10) **1**: 344–345.
1078 Size differences in the little "Pichi" armadillos. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (10) **1**: 526–527.
1079 The Delacour Exploration of French Indo-China.—Mammals. II. On mammals collected during the winter of 1926–1928. *Proceedings of the Zoological Society of London* 139–150.
1080 The generic name *Delphax* in mammalogy. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (10) **1**: 623.
1081 A remarkably coloured squirrel from N. Siam. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (10) **2**: 100–101.
1082 The South Tenasserim race of *Paguma leucomystax*, Gray. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (10) **2**: 101–102.
1083 The Godman–Thomas Expedition to Peru.—VII. The mammals of the Rio Ucayali. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (10) **2**: 249–265.
1084 The Godman–Thomas Expedition to Peru.—VIII. On mammals obtained by Mr. R. W. Hendee at Pebas and Iquitos, upper Amazons. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (10) **2**: 285–294.
1085 Two new S.W. African mungooses. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (10) **2**: 408.
1086 A new *Echimys* from eastern Ecuador. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (10) **2**: 409–410.
1087 Note on *Sciurus splendidus*, Gray. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (10) **2**: 590.

1929

1088 The Delacour Exploration of French Indo-China.—Mammals. III. Mammals collected during the winter of 1927–28. *Proceedings of the Zoological Society of London* (1928): 831–841.
1089 A new bandicoot-rat from western Siam. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (10) **3**: 205.
1090 A new mole from western Siam. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (10) **3**: 206–207.
1091 On mammals from the Kaoko-Veld, South West Africa, obtained during Captain Shortridge's fifth Percy Sladen and Kaffrarian Museum Expedition. *Proceedings of the Zoological Society of London* 99–111.

1092 The mammals of Senor Budin's Patagonian Expedition, 1927–1928. *Annals and Magazine of Natural History; including Zoology, Botany and Geology*, London (10) **4**: 35–45.

Reports, brief accounts of papers presented, or of specimens exhibited at the Scientific Meetings of the Zoological Society of London, and published (1880–1903) in the 'Minutes' and later (1904–1919) in the 'Abstracts' of the Proceedings of the Society, but not including any validly proposed names.

1880

A01 [Description of a new species of *Mus*, obtained from the island of Ovalau, Fiji.] 6 January.
A02 [Note on a specimen of *Myoxus elegans*.] 3 February: 1.
A03 [On a collection of mammals brought from Ecuador by Mr. Clarence Buckley.] 4 May: 3.
A04 [A new species of *Reithrodon* obtained in Venezuela by the late Mr. D. Dyson.] 14 December: 2.

1882

A05 [On the African mungooses (Herpestinae).] 3 January: 1.
A06 [Account of a series of rodents from Northern Peru.] 17 January: 1.
A07 [Descriptions of a small series of rodents from Damara Land.] 21 February.
A08 [Account of a small collection of mammals from Durango.] 18 April: 1.
A09 [Description of two new species of fruit bats of the genus *Pteropus* from the Caroline Islands.] 19 December: 3.

1885

A10 [Mammals obtained and observed by Mr. [H. H.] Johnston.] 3 March: 1.
A11 [Exhibition of, and remarks upon, a rare burrowing rodent (*Heterocephalus glaberi*).] 16 June: 1.
A12 [A description of *Heterocephalus phillipsi*.] 17 November: 2.

1886

A13 [List of mammals collected by A. O. Hume.] 19 January: 2.
A14 [On the wallaby commonly known as *Lagorchestes fasciatus*.] 7 December: 2.

1887

A15 [Mammals obtained by Mr. H. H. Johnston on the Cameroons Mountains.] 1 February: 1.
A16 [Small mammals collected in British Guiana by Mr. W. L. Sclater.] 15 February: 1.
A17 [Bats collected by Mr. C. M. Woodford in the Solomon Islands.] 15 March: 1.

1888

A18 [A collection of mammals obtained by Emin Pasha in central Africa.] 17 January: 1.
A19 [A new genus and species of Muridae obtained by Mr. H. O. Forbes in New Guinea.] 17 April: 2.
A20 [A collection of small mammals obtained by Mr. William Taylor in Duval County, Texas.] 20 November: 2.
A21 [The mammals obtained by Mr. C. M. Woodford during his second expedition to the Solomon Islands.] 4 December: 1.

1889

A22 [A specimen of a new muntjac from Tenasserim.] 5 March: 1.
A23 [Description of a new Bornean monkey.] 19 March: 1.
A24 [Preliminary notes on different species of otter.] 2 April: 1.
A25 [Mammals from Mount Kina Balu obtained by Mr. John Whitehead.] 16 April: 1.

1891

A26 [A collection of small Mammalia made by Mr. F. J. Jackson, F.Z.S., in eastern central Africa.] 3 March: 1

A27 [Antelopes procured by Mr. T. W. H. Clarke in Somali-Land.] 17 March: 1.
A28 [Notes on various species of ungulates.] 16 June: 1.

1892

A29 [Account of the species of the Hyracoidea.] 5 January: 2.
A30 [A head of the East African oryx.] 15 March: 1.
A31 [Probable identity of Lidth de Jeude specimens.] 3 May: 1.
A32 [Review of antelopes of the genus *Cephalophus*.] 17 May: 2.
A33 [On the genus *Echinops*.] 14 June: 2.
A34 [A collection of mammals from Nyassa-land.] 1 November: 2.

1893

A35 [Examples of a Bornean monkey.] 17 January: 1.
A36 [Use of the word "type".] 14 March: 1.
A37 [Remarks on *Nanotragus livingstonianus*.] 14 March: 1.
A38 [A second collection of mammals sent by Mr. H. H. Johnston.] 16 May: 1.

1894

A39 [The skin of a giraffe from Somaliland.] 20 February: 1.
A40 [Dwarf antelopes of the genus *Madoqua*.]. 3 April: 1.
A41 [Account of the gazelles of Algeria.] 5 June: 1.

1895

A42 [On *Putorious africanus*.] 5 February: 1.
A43 [Mammals from Aden.] 18 June: 3. [With J. W. Yerbury].

1896

A44 [On further collections from Nyasa-land.] 17 November: 1.

1897

A45 [A remarkable partially white antelope of the genus *Cervicapra*.] 30 November: 1.
A46 [On the mammals obtained by Mr. A. Whyte in north Nyasaland, and presented to the British Museum by Sir H. H. Johnston, K.C.B.] 14 December: 1.

1898

A47 [On some mammals collected by the late Mr. Henry Durnford in 1877–8 in Chubut, Patagonia.] 15 March: 2.
A48 [Remarks on *Sciurus finlaysoni*.] 5 April: 1.
A49 [Mammals collected by Mr. J. D. D. la Touche near Kuatan, N.W. Fokien.] 15 November: 4.
A50 [Letter from Senor Ameghino, C.M.Z.S., on *Neomylodon*.] 29 November: 7.

1900

A51 [Exhibition of mounted heads of Nile antelopes.] 6 February: 19.

1901

A52 [Exhibition of the skull of a common fox (*Canis vulpes*) with supernumerary upper incisors.] 15 January: 15.

1903

A53 [Exhibition of a drawing of a skin of a female gazelle with a perfect hair-whorl on the withers.] 17 November: 8.

1904

A54 [Exhibition of a new subspecies of *Gazella soemmerringi*.] 19 January: 15.
A55 [A collection of mammals from Namaqualand.] 2 February: 19. [With H. Schwann].
A56 [A communication on a new subspecies of duiker.] [On behalf of W. Rothschild]. 16 February: 21.

A57 [Exhibition of, and remarks on, the skull of a buffalo.] 1 March: 25.
A58 [Exhibition of a specimen of a fruit bat.] 1 March: 25.
A59 [Mammals obtained by the late Mr. W. G. Doggett on the Anglo-German Boundary Commission.] 19 April: 33.
A60 [Exhibition of skulls of north Australian rock-wallaby (*Peradorcas concinna*).] 19 April: 33.
A61 [Osteology and systematic position of the rare Malagasy bat *Myzopoda aurita*.] 3 May: 37.
A62 [Sketch of hind and fawn of Pere David's deer (*Elaphurus davidianus*).] 7 May: 39.
A63 [Exhibition of a new species of pig from central Africa.] 15 November: 4.
A64 [On the mammals collected by Mr. E. Seimund in Fernando Po.] 15 November: 4.
A65 [Exhibition of specimens of a gazelle from Palestine, described as a new species.] 13 December: 11.

1906

A66 [A second collection of mammals made in Western Australia for Mr. W. E. Balston.] 13 November, No. 35: 18.
A67 [Sixth instalment of the results of the Rudd Exploration of South Africa.] 13 November, No. 35: 18. [With H. Schwann].
A68 [On mammals collected in Korea and Quelpart Island by Mr. Malcolm P. Anderson.] 27 November, No. 36: 22.

1907

A69 [Exhibition of a collection of mammals and birds from the islands of Saghalien and Hokkaido, N. Japan, made by Mr. Malcolm P. Anderson.] 5 February, No. 39: 5.
A70 [List of small mammals which had been obtained in the islands of Saghalien and Hokkaido by Mr. M. P. Anderson for the Duke of Bedford's exploration of eastern Asia.] 23 April, No. 44: 24.
A71 [Fifth of the series of papers on the mammals collected by Mr. M. P. Anderson during the Duke of Bedford's exploration of eastern Asia.] 7 May, No. 45: 28.
A72 [Mammals collected at Beira by Mr. C. H. B. Grant, being No. VIII of the series of papers on the Rudd exploration of South Africa.] 12 November, No. 48: 39.

1908

A73 [On mammals obtained in the Shantung Peninsula, N. China, by Mr. M. P. Anderson, for the Duke of Bedford's exploration of eastern Asia.] 14 January, No. 51: 1.
A74 [On mammals from the islands of Tsu-shima, between Korea and Japan, collected by Mr. M. P. Anderson, for the Duke of Bedford's exploration of eastern Asia.] 4 February, No. 52: 3.
A75 [On mammals collected by Mr. M. P. Anderson during a trip to the Mongolian Plateau, N.W. of Kalgan.] 18 February, No. 53: 6.
A76 [On "Mammals obtained by Mr. C. H. B. Grant in the Gorongoza Mountains, Portuguese S.E. Africa".] 17 March, No. 55: 12. [With R. C. Wroughton].
A77 [On mammals from Inkerman, near Townsville, north Queensland, collected by Mr. W. Stalker.] 3 November, No. 61: 35.

1912

A78 [Exhibition of, and remarks upon, a peculiar Amazonian monkey (*Callimico goeldii*).] 26 November, No. 114: 49.

1914

A79 [Report on the mammals collected by the British Ornithologists' Union and Wollaston Expedition in Dutch New Guinea.] 7 April, No. 131: 24–25.

1919

A80 [Exhibition of three interesting mammals obtained by Dr. Aders, F.Z.S., in Zanzibar.] 21 October, No. 196: 27.

INDEX TO NAMES PROPOSED BY OLDFIELD THOMAS

This Index associates the serial number of each of Thomas' publications as listed in this Bibliography with the page in that paper on which any new name is proposed, and gives details of plates and figures where appropriate. In a few instances where a brief diagnosis precedes the formal description, as for example when a new name is initially diagnosed in a key and described in full later in the paper the pagination for both has been given.

ACKNOWLEDGEMENTS

My thanks are due to the sometime Keeper of Zoology at the British Museum (Natural History), Mr. J. F. Peake, who has provided facilities that have enabled me to carry out and complete this essay into the past, and to the Head of Library Services, Mr. R. E. R. Banks, who has made available the resources of the library in his charge, and who has

been a constant source of encouragement. Mr. R. A. Fish, Librarian at the Zoological Society of London was able to produce copies of some of the Society's less well known publications. The staff of the Mammal Section at the Museum have as always extended numerous courtesies to an erstwhile colleague, and I am grateful also to my wife for her support and especially for the arrangement of the index.

APPENDIX 1

Unofficial workers or volunteers during Thomas' service as Assistant in charge of mammals at the British Museum (Natural History).

K. Andersen ('The Viking')
G. Barrett-Hamilton
Dorothea M. Bate
J. L. Bonhote
Winifred Davison
W. de Winton
D. G. Elliot
T. B. Fry ('Brother Tom')
M. A. C. Hinton
R. Lydekker
G. S. Miller
R. I. Pocock
Kathleen V. Ryley
H. Schwann
Jane St. Leger
R. C. Wroughton

APPENDIX 2

Mammals named after Oldfield Thomas.

Microgale thomasi Forsyth Major, 1896
Sorex thomasi Ognev, 1921
Blarina thomasi Merriam, 1897
Crocidura thomasi Sowerby, 1917
Rhinolophus thomasi Andersen, 1905
Lonchophylla thomasi J. A. Allen, 1904
Uroderma thomasi Andersen, 1906
Myotis thomasi Cabrera, 1901
Minetillus thomasi Hinton, 1920
Tadarida thomasi Wroughton, 1919
Opolemur thomasi Forsyth Major, 1894
Galago (Hemigalago) thomasi Elliot, 1907
Midas thomasi Goeldi, 1907
Lagothrix thomasi Elliot, 1909
Cercopithecus thomasi Matschie, 1905
Ursus ornatus thomasi Hornaday, 1911
Lyncodon patagonicus thomasi Cabrera, 1928
Crocuta thomasi Cabrera, 1911
Felis pajeros thomasi Lönnberg, 1913
Felis (Microfelis) nigripes thomasi Shortridge, 1931
Sciurus thomasi Nelson, 1899
Funambulus thomasi Wroughton & Davison, 1919
Petaurista thomasi Hose, 1900
Petaurista leucogenys thomasi Kuroda & Mori, 1923 (renamed *Petaurista leucogenys huntoni* Mori, 1923)
Oldfieldthomasia Ameghino, 1901
Procavia thomasi Neumann, 1901
Odocoileus thomasi Merriam, 1898
Cephalophus thomasi Jentink, 1901
Cobus thomasi Sclater, 1896
Rhynchotragus thomasi Neumann, 1905
Thomasomys Coues, 1884
Peromyscus (Megadontomys) thomasi Merriam, 1898
Zygodontomys thomasi J. A. Allen, 1901
Rheomys thomasi Dickey, 1928
Lophiomys thomasi Heller, 1912
Otomys thomasi Osgood, 1910
Microtus (Putymys) thomasi Barrett-Hamilton, 1903
Mus thomasi de Winton, 1897
Salpingotus thomasi Vinogradov, 1928
Mesomys thomasi Ihering, 1897

REFERENCES

Andersen, K. 1912. *Catalogue of the Chiroptera in the collection of the British Museum. 2nd ed. I. Megachiroptera*. London: British Museum (Natural History).

Hinton, M.A.C. 1929. Mr. M. R. Oldfield Thomas. *Nature, London* **124** (3116): 101–102.

Martin Duncan, F. 1937. On the dates of publication of the Society's 'Proceedings', 1859 – 1926. With an appendix containing the dates of publication of 'Proceedings', 1830 – 1858, compiled by the late F. H. Waterhouse, and of the 'Transactions', 1833 – 1869, by the late Henry Peavot, originally published in P. Z. S. 1893, 1913. *Proceedings of the Zoological Society of London* 71–84.

Miller, G. S. 1912. *Catalogue of the mammals of western Europe*. London: British Museum (Natural History).

—— 1915. The jaw of Piltdown Man. *Smithsonian Miscellaneous Collections* **65** (12) : 1–31, 5 pls.

—— 1918. The Piltdown jaw. *American Journal of Physical Anthropology*, Washington 1 : 25–52, 4 pls.

P[ocock], R.I. 1930. Obituary notice of Michael Rogers Oldfield Thomas. (With portrait). *Proceedings of the Royal Society of London* (B) **106** : i–v, 1 pl.

Seba, A. 1734. Locupletissimi rerum naturalium thesauri accurata descriptio, et iconibus artificiosissimus expressio, per universam physices historiam . . . . Amsterdam.

CONTENTS

Bulletin British Museum (Natural History)
HISTORICAL SERIES
Vol 18, No 1, May 1990

Historical Series

VOLUME 18 NUMBER 2 29 NOVEMBER 1990

The *Bulletin of the British Museum of Natural History*, instituted in 1949, is issued in four scientific series, Botany, Entomology, Geology (incorporating Mineralogy) and Zoology, and an Historical Series.

The Historical Series is edited in the Museum's Department of Library Series
Head of Department: Mr R. E. R. Banks
Editor: Miss P. Gilbert

Papers in the *Bulletin* are primarily the results of research carried out on the unique and ever-growing collections of the Museum, both by the scientific staff and by specialists from elsewhere who make use of the Museum's resources. Many of the papers are works of reference that will remain indispensable for years to come.

A volume contains about 256 pages, made up of two numbers: published Spring and Autumn. Subscriptions may be placed for one or more of the series on an Annual basis. Individual numbers and back numbers can be purchased and a Bulletin catalogue, by series, is available. Orders and enquiries should be sent to:

Sales Department,
Natural History Museum Publications,
Cromwell Road,
London SW7 5BD

Telephone: 071-938-9386
Fax: 071-938-8709

World List abbreviation: *Bull. Br. Mus. nat. Hist* (hist. Ser.)

ISBN 0 565 09014 3
ISSN 0068 2306

Historical Series
Vol 18, No. 2, pp 115–228

British Museum (Natural History)
Cromwell Road
London SW7 5BD

Issued 29 November 1990

Typeset by J&L Composition Ltd, Filey, North Yorkshire
Printed in England by Henry Ling Ltd, The Dorset Press, Dorchester, Dorset

Bull. Br. Mus. Nat. Hist. (hist. Ser.) **18**(2): 115–143 Issued 29 November 1990

The *Challenger* Expedition (1872–1876), Henry Bowman Brady (1835–1891) and the *Challenger* Foraminifera

ROBERT WYNN JONES

BP Research Centre, Chertsey Road, Sunbury-on-Thames, Middlesex, TW16 7LN

CONTENTS

INTRODUCTION

It is now over a hundred years since the cruise of H.M.S. *Challenger* (1872–1876) and the subsequent publication of the report on the *Challenger* foraminifera by Henry Bowman Brady[1] (1884); indeed, 1991 marks the centenary of Brady's death. So why the interest? The answer is two-fold but simple.

Firstly, because the *Challenger* expedition fundamentally and significantly advanced numerous fields in the earth, life and ocean sciences, and indeed has been described as representing 'the greatest advance in the knowledge of our planet since the celebrated geographical discoveries of the fifteenth and sixteenth centuries' (Linklater, 1972). It also heralded the dawn of a new, modern, multi-disciplinary era of oceanography, such that its significance may be justly compared with that of the voyage of the *Beagle* (made famous by Charles Darwin) in other areas of scientific interest and endeavour.

Secondly, because Brady's work on the *Challenger* foraminifera detailed for the first time the dominant microfaunal element in the largest biotope on the face of the earth—the abyssal plains of the deep sea—until shortly beforehand thought to be incapable of sustaining life. The *Challenger Report* (Brady, 1884) features 915 (15% of the total number of extant) species belonging to 368 (44% of the total number of extant) genera, including the type-species of 284 genera (34%). The comprehensiveness and attention to detail exhibited in this work is such that it remains the most famous of the classic monographs of foraminiferal studies and the most often cited. Also, of all the collections in the British Museum (Natural History), none is more important or more frequently consulted than the *Challenger* collection.

This paper consists chiefly of historical notes on the *Challenger* expedition, biographical notes on H. B. Brady and curatorial notes on the *Challenger* foraminifera. The concluding part outlines plans for a taxonomic revision of the *Challenger* foraminifera.

THE *CHALLENGER* EXPEDITION (1872–1876)

Prelude to the Expedition

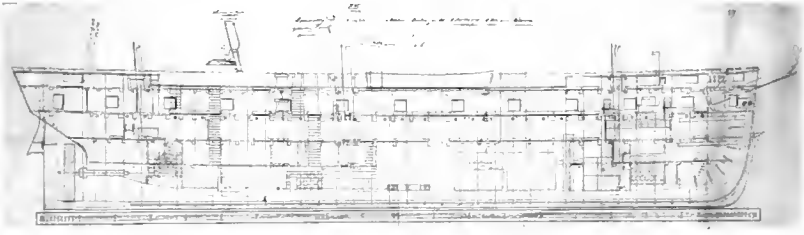
The reasoning behind the commissioning of the *Challenger* expedition is best understood in its historical context. Britain in the latter half of the last century was at her mightiest as an imperial power. She was above all a maritime power, proud of her naval achievements at war and in peace-time.

When the news of impending American and German voyages of scientific exploration broke in London in 1871, William Benjamin Carpenter (1813–1885) urged prompt action to maintain Britain's leading position in marine science. In an address to the Royal Institution and later in a letter to G. G. Stokes (Secretary of the Royal Society, of which Carpenter was President), Carpenter suggested the draughting and submission to parliament of a joint plan for a circumnavigation of the globe which would take the concepts and techniques developed and pioneered on the North-East Atlantic voyages of the *Lightning* (1868) and *Porcupine* (1869, 1870) and put them to work on the oceans of the world. In further correspondence with George Goschen (First Lord of the Admiralty), Carpenter received assurances that the government would give favourable consideration to such a proposal.

Carpenter was a remarkable man who held a number of honorary positions and titles and was at various times Lecturer on Medical Jurisprudence at the Bristol Medical School, Lecturer on Physiology at the London Hospital, Fullerian Professor of Physiology at the Royal Institution and Professor of Forensic Medicine at University College, London and Registrar of the University of London. In the words of the *Dictionary of National Biography* (Lee, 1898), he was '. . . a man of no ordinary mental grasp and range of study . . .' and '. . . one of the last examples of an almost universal naturalist . . .'. He published variously on physiology, behavioural psychology, evolutionary theory (a deeply religious man who played the organ at the Unitarian Church in Hampstead, he was a rather reluctant ally of Darwin) and microscopy, always in a lucid and often ratiocinative style. He was a particular authority on oceanography, marine biology and foraminiferology (see, for instance, Carpenter, 1862, 1883; Murray, 1971, 1981, 1989; Murray & Taplin, 1984a–b).

Once Carpenter's circumnavigation plan had been tacitly approved by the Admiralty, and the approval communicated to the Royal Society, a committee was set up under the auspices of that august body which comprised Carpenter himself, J. D. Hooker,

Plate 1 **Top left:** Carpenter. **Top right:** Hooker. **Bottom left:** Huxley. **Bottom right:** Jeffreys. From the Brady Family Photograph Album. Reproduced by kind permission of Newcastle-upon-Tyne City Libraries & Arts.



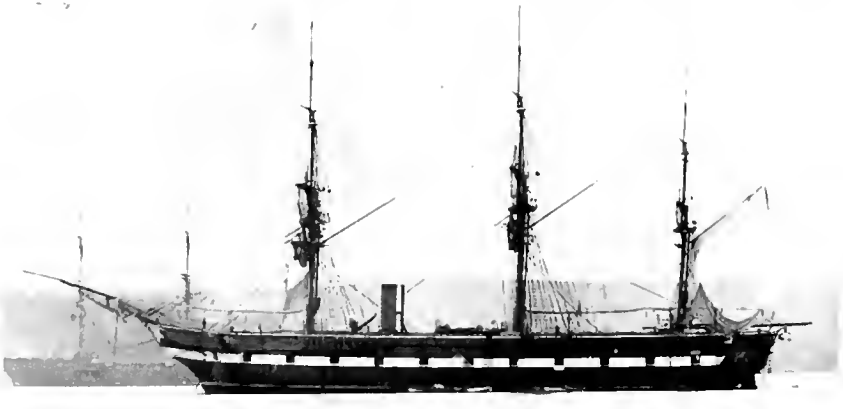


Plate 2 **Top:** H.M.S. *Challenger* in starboard view with funnel lowered. **Middle:** Plans for her refit. **Bottom:** Port view with funnel raised, Sydney approaches, June 1874. Reproduced by kind permission of the trustees of the National Maritime Museum, Greenwich.

T. H. Huxley, J. G. Jeffreys (see Plate 1), Captain Richards, Professor Charles Wyville Thomson and Sir William Thomson (later Lord Kelvin). On the recommendation of these eminent personages, the Council of the Royal Society made a formal request to the government to send out an expedition to undertake a scientific study of the oceans. The request was granted in April, 1872, and preparations for departure began immediately. The organisation of the voyage (Burstyn, 1968, 1972) proceeded remarkably swiftly and efficiently, due doubtless in part to previous experience in similar ventures but probably also in no small measure to political factors (it is noteworthy that Carpenter had social contacts with the then Prime Minister Gladstone).

A suitable vessel, H.M.S. *Challenger* (Rice, 1986; Plate 2) was chosen in the summer of 1872, and a schedule for her voyage drawn up for which the Navy Hydrographer G. H. Richards was largely responsible. *Challenger* was a 226′, 1462-ton (builder's measurement) or 2306-ton (displacement) 'Pearl' class steam-assisted screw corvette. Her engines were nominally of 400 h.p. but capable of 1234 h.p., and she also carried 16000 square feet of sail. She had been built at Woolwich in 1858 and had seen naval service off the Americas and later in Australasia before returning to England in 1871. Preparatory to what was to become her most famous voyage, she was fitted out at Sheerness, where all but two of her twenty-two cannon were removed to make way for a dredging platform over the upper deck forward of the main mast, extra laboratories, work-rooms and storage space.

The Aberdonian Captain (later Rear-Admiral Sir) George Strong Nares (1829–1915) was chosen by the Admiralty to take the helm. Under him were some score of officers and crew (see Plate 3), including Paymaster R. R. A. Richards, Lieutenant P. Aldrich, Lieutenant A. Balfour, Sub.-Lieutenant Campbell and Navigating Sub.-Lieutenant Swire, all of whom kept journals (Swire's being memorable for some less than reverential references to Wyville Thomson's appearance and manner!) Nares left *Challenger* in 1874 to lead the *Alert* and *Discovery* Arctic expedition, and was replaced by Captain Frank Tourle Thomson. Aldrich left with him and was replaced by a Lieutenant A. Carpenter.

Wyville Thomson (see Plate 3) was appointed by the Royal Society as head of the civilian scientific team, Carpenter at 59 having decided he was too old to put to sea again. He was to be assisted on board by secretary and ship's artist John James Wild, chemist John Young Buchanan (see Plate 3) and three naturalists, Henry Nottidge Moseley, Rudolph von Willemöes-Suhm (whose promising career was cut short when he died on board *Challenger*) and John Murray.

Wyville Thomson was born in 1830 at Linlithgow in Scotland and received his early education at Merchiston Castle School. He matriculated at the age of sixteen as a student of Medicine at Edinburgh University, where he seems largely to have pleased himself in the choice of lectures he attended, taking in such subjects as zoology, botany and geology; he was also active in his role as Secretary of the Royal Physical Society. He gave up his medical studies in 1850 on the grounds of ill health and embarked instead on a career in natural science, succeeding to the posts of Lecturer in Botany at King's College, Aberdeen in 1850, Professor of Botany at Marischal College, Aberdeen in 1851, Professor of Natural History at Queen's College, Cork in 1853, Professor of Mineralogy and Geology at Queen's College, Belfast in 1854, Professor of Zoology and Botany at Belfast in 1860 and Allman Professor of Natural History at Edinburgh University in 1870. He was reputedly a delightful and instructive lecturer on a variety of scientific subjects, speaking without notes but with constant reference to the profusive array of specimens on his table.

Wyville Thomson was, with Carpenter, instrumental in setting up the *Lightning* and *Porcupine* expeditions, the results of which were published in his book *The Depths of the Sea* (Wyville Thomson, 1873). He was widely recognised on account of this work as an active instigator and leading spirit of new and successful investigations. It was natural

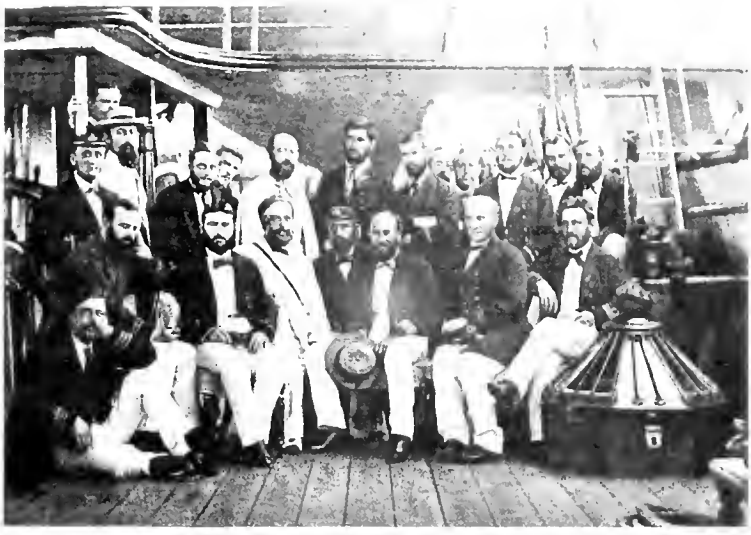
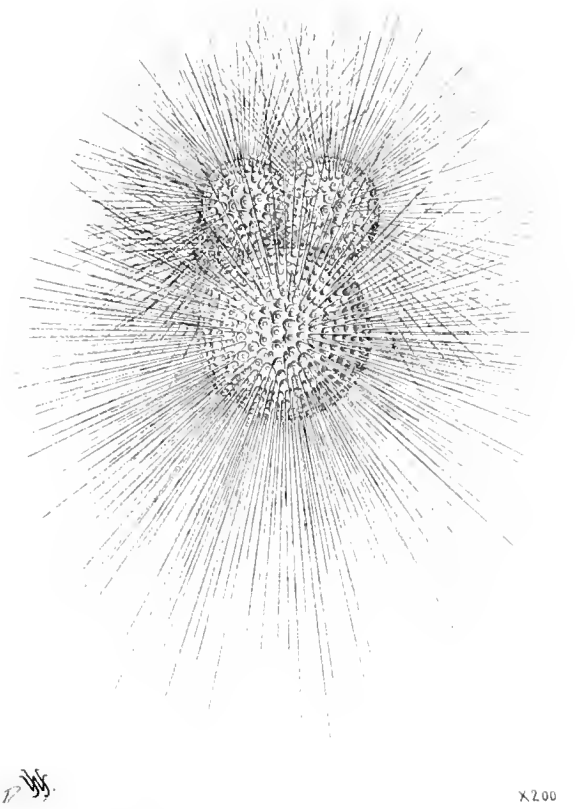


Plate 3 **Top left:** The crew of H.M.S. *Challenger*. *Standing (left to right)*: Balfour, Buchanan, Willemoes-Suhm, Aldrich, Ass. Engineer W. A. Howlett, Wild, Swire, Ass. Paymaster J. Hynes, Moseley, Sub.-Lieut. A. Channer, Richards, Sub.-Lieut. H. E. Harston, Murray, Lieut. A. C. Bromley. *Seated (left to right)*: Cdr. J. F. L. P. Maclear, Surgeon G. Maclean, Nav. Sub.-Lieut. A. Havergal, Wyville Thomson, Engineer W. J. J. Spry, Nares, Staff Surgeon A. Crosby, Lieut. G. R. Bethel, unknown. **Bottom left:** Pen and wash sketch by Elizabeth Gulland showing Wyville Thomson (left) and Buchanan (right) at work on board *Challenger*. **Right:** Original drawing made by Wild on board *Challenger* of the planktonic foraminifer *Globigerina bulloides* d'Orbigny, subsequently used in the *Challenger Report* (Brady, 1884, Pl. 77). Signed bottom left. Reproduced by kind permission of Edinburgh University Library.



therefore that he should be appointed as chief naturalist on the *Challenger* expedition. It is unfortunate that his health broke down in the wake of the expedition and that he did not have the freedom to finish his original research on the *Challenger* crinoids and sponges, having to concentrate instead on his administrative responsibilities. Nonetheless he received international recognition for his career on the *Challenger*, which he wrote up in the form of the scholarly and erudite book *The Voyage of the Challenger* . . . (Wyville Thomson, 1877). For instance, he received a Royal Society Gold Medal in 1876 (having already acceded to the fellowship of that institution in 1869) and was made a Knight of the British Empire in 1876 and a Knight of the Polar Star (an honorary title bestowed at the University of Uppsala on the occasion of its quatercentenary celebrations) in 1877. He died in 1882, wherepon a memorial window was installed in the Linlithgow Cathedral and a bust in Edinburgh University. Further details of his life are given by Herdman (1923).

Moseley was a no less able or enthusiastic fellow, of whom it was once said that 'you had only to put him down on a hillside with a piece of string and an old nail, and in an hour or two he would have discovered some natural object of surpassing interest' (Herdman, 1923). He wrote up his experiences on board *Challenger* in the lively and

enjoyable book *Notes by a Naturalist* . . . (Moseley, 1879), the enduring popularity of which is evident from the fact that it was reprinted as recently as 1944 in a series entitled *Live Books Resurrected*! He went on from his *Challenger* exploits to become a Fellow of the Royal Society and Linacre Professor of Human and Comparative Anatomy at Oxford.

Murray (see, for instance, Herdman, 1923 & Boog Watson, 1967) was Canadian-born but of Scots ancestry. He registered as a medical student at Edinburgh University, where one of his fellow students, Robert Louis Stevenson, came to criticise him for failing to pursue his studies in 'orderly, purposive and profitable fashion'. Rather like Wyville Thomson before him, he attended lectures not strictly connected with his course-work, for instance on chemistry, natural history, literature, law and theology. He spent his summer vacations indulging his interests in marine biology and oceanography in dredging trips off the Scottish coasts (on one such occasion meeting Sir William Thomson on Skye) and had enterprisingly enrolled as a surgeon aboard the whaler *Jan Mayen* in 1868, spending 7 months in the Arctic. Enough was known of the rare talent of this remarkable man even by 1872, when he was only 31, that he was appointed to the prestigious post of *Challenger* naturalist (albeit as a replacement for William Stirling, who had resigned his appointment) on the recommendation of the eminent Edinburgh University physicist Professor Peter Guthrie Tait. He is acknowledged as the 'father of modern oceanography' on account of his many achievements in the wake of the *Challenger* cruise. He went on to be made a Fellow of the Royal Society in 1896 and was knighted in 1898.

By December, 1872, the scientists and crew were assembled and all the necessary equipment was on board. Most of the equipment had been tried and tested on earlier voyages. Nets, trawls and dredges were to be put out on hempen lines. Temperature measurements were to be taken with Miller-Casella thermometers (appropriately compensated for pressure), though some Siemen's and Johnson's instruments were also taken (as was Siemen's photometric apparatus). Intermediate depth water samples were to be collected by a stopcock water bottle designed by Buchanan and deep water samples by a slip water bottle used by the German North Sea expedition. Bottom sediment samples were to be brought up from the sea floor using a *Hydra* sounding tube, modified in 1873 by Lieutenant C. W. Baillie. Only Sir William Thomson's sounding device, comprising piano-wire wound around a drum, was an unknown quantity. This had proved successful in trials aboard the *Lalla Rookh* in comparatively shallow water, but when it was tried aboard *Challenger* its drum collapsed; hence, depth measurements aboard *Challenger* came to be taken with hempen lines and are inaccurate. Many of the instruments used aboard *Challenger* are figured by McConnell (1981).

Challenger finally set sail from Portsmouth on 21 December 1872. Her three-and-a-half year long voyage covered some 68890 nautical miles and involved sampling at 362 stations, besides coaling stops or more protracted periods ashore at a great many ports-of-call (at many of which her crew attended or organised lavish social functions). She returned to Spithead on 24 May 1876, and was broken up at Chatham in 1921. Only her figurehead survives to this day, outside the Institute of Oceanographic Sciences in Wormley, Surrey.

Aims of the Expedition

Challenger was confidently expected to bring back the answers to all the questions posed by earlier studies of the North-East Atlantic. These were concerned largely with the nature and distribution of bottom sediments, with problems of oceanic circulation and with the very existence of life itself in the deepest parts of the oceans.

Deep-Sea Sediments

With regard to the nature of bottom sediments, important new discoveries were made almost from the outset of the voyage. The first samples recovered from the sea bed proved, as expected, to be of pale grey '*Globigerina* ooze'. It had been predicted that this would cover the entire sea floor. However, as the cruise progressed westward on the leg from Teneriffe to the West Indies and into ever deeper waters, the nature of the recovered sediments was observed gradually to change. They became darker and darker in colour, and upon microscopical examination proved to comprise fewer and fewer foraminiferal remains.

On 18 February 1873, deep-water samples from Station 3 (24 deg. 45′N; 20 deg., 14′W) were observed to contain 'a number of very peculiar black oval bodies about an inch long'. These were first thought to be fossils or lumps of pitch, but Buchanan's chemical analyses showed them to be composed of almost pure manganese peroxide. They were the first recorded examples of what we now term manganese nodules.

On 26 February 1873, a sample brought up from 3150fm. proved to comprise, in Wyville Thomson's words 'a perfectly smooth red clay, containing scarcely a trace of organic matter'. Wyville Thomson's initial surmise was that this would turn out to be a local phenomenon. This seemed to be borne out when, from the shallower Dolphin Rise, more '*Globigerina* ooze' was recovered. However, the passage into the deeper waters of the Western Atlantic again saw clay return as the dominant substrate.

The widespread distribution of clay on the sea floor was confirmed on the leg between the West Indies by way of the Puerto Rico Trench to Bermuda. This necessitated a reconsideration by Wyville Thomson of its significance. He came to regard it as typical of deep areas, supposing these areas to be too deep to sustain the '*Globigerinae*' that made up shallower sediments. As Murray had by this time shown that '*Globigerinae*' were planktonic organisms ubiquitous in surface waters and raining down upon the whole sea floor upon death, a problem arose. What could account for their absence in deep areas? Close inspection of samples from progressively deeper waters showed a progressive disappearance not only of foraminifera but also of all other calcareous organisms. Wyville Thomson came to the conclusion that a chemical reaction was removing calcium carbonate at depth and that the product of this reaction was clay. Buchanan invoked carbonic acid as responsible for the carbonate dissolution, and modelled the reaction in his laboratory. The 'snow line' below which calcite passes into solution was first described by Murray and the Belgian Abbé Renard. It was with this that the modern idea of the calcite compensation depth was conceived, though it was not until the latter half of this century that it was named as such and fully quantified.

In 1875 *Challenger* set out into the Pacific for the first time, following the American U.S.S. *Tuscarora* and the German S.S. *Gazelle*. The combined efforts of all three vessels showed this ocean to differ markedly from all others, not only in terms of its greater areal extent but also in terms of its greater depth. By virtue of the latter feature, it was found also to comprise proportionately larger areas underlain by clay. Here, though, the clay was associated with larger mineral particles. This led Murray to question Wyville Thomson's theory that the clay represented the residue derived from dissolution of '*Globigerina* ooze'. Murray came to favour a volcanic origin for the clay, citing as evidence the proximity of numerous volcanic centres (the 'Pacific ring of fire') and the relative ease with which their products could be transported into deep water. Militating somewhat against this was the associated occurrence of manganese nodules of apparently concretionary habit. Murray ascribed the origin of these nodules to volcanism also, while Buchanan had by this time come to favour mineralisation of organic remains as the most likely mechanism for their formation. Later, the French geologist Dieulafait hypothesised that they originated by precipitation from sea water at the surface following

a reaction between salt water and the atmosphere. Even to this day, their precise origin remains somewhat problematic.

Oceanic Circulation

In 1873, on the leg between Bermuda and Halifax, Nova Scotia, a detour was made to enable *Challenger* to study the Gulf Stream. This had first been described by the sixteenth-century explorer Ponce de Leon, following a voyage from Puerto Rico to Teneriffe which crossed what is now termed the Florida Current in the vicinity of Cape Canaveral. Conjectures about its nature were published by Peter Marytr of Anghrera also in the sixteenth century, and the line of demarcation between warm and cold water masses was first recorded by Lescarbot in the seventeenth. Cold water eddies were known by 1810, and there had been a great deal of subsequent research done by the U.S. Coast Survey: a synthesis of data had been published in 1868.

Serial temperature measurements made by the *Challenger* crew essentially confirmed what had been observed earlier, namely that there was a relatively shallow body of warm water forming the current and a deeper body of cool water underlying it and rising to the surface at its western flank.

Velocity measurements were made both at the surface and at depth on the whole of the ensuing equatorial Atlantic leg in order to ascertain whether there was any subsurface movement of water in a direction counter to that at the surface. A drogue of similar design to that used by Nares and his crew aboard the *Shearwater* was used to track the undercurrents. At Station 106, it was shown using this apparatus that the stength of the surface current diminished with increasing depth and ceased to have any measurable effect at 75fm. Unfortunately, the shipboard scientists were content to note at this juncture 'how very superficial the Equatorial Current is'. Had they made additional measurements at greater depth, they would undoubtedly have discovered for the first time the existence of the Equatorial Counter Current. As it transpired, this was discovered by Buchanan during a subsequent cruise on the cable vessel *Buccaneer*.

As *Challenger* sailed from the Cape Verde Islands to Brazil, the temperature readings that she was taking were observed to form a distinct pattern. Nares speculated that the 'cold stream' to the west was separated from warmer waters to the east by a north-south trending shoal system (subsequently confirmed by sounding) that acted as a barrier to mixing. We now recognise this as the Mid-Atlantic Ridge, a centre of sea-floor spreading, and the Walvis Ridge (discovered when *Challenger* re-entered the South Atlantic in 1876) running roughly at right angles to it as a transform fault system. The numerous 'sills' recorded in the East Indian archipelago are also now interpreted in terms of modern plate tectonic theory, as parts of an island arc system.

While the *Challenger* crew and scientists relaxed at one of their many ports-of-call (Sydney, Australia) in March 1874, controversy was raging back in England over the causes of ocean currents. It had been contended by Carpenter that the motive force lay in the superior weight of one column of water over another. This thesis was held to be untenable by James Croll, in that it presupposed the existence of a significant difference in level between one part of the ocean and another. Observations from the *Challenger* cruise did seem to indicate that a dynamic circulatory system could be generated and maintained by temperature gradients, as then advocated by Carpenter. But Croll remained unconvinced, citing wind-stress as an equally likely alternative explanatory mechanism. He attacked Carpenter from many fronts, having at his disposal a greater knowledge of physical processes and a commendable tenacity. But he was unable to win the war of words, in which Carpenter's literary grace was a great advantage, or indeed to shift Carpenter from his entrenched position. Later, Wyville Thomson was to argue that

there was not the slightest ground for supposing that such a thing existed as 'a general vertical circulation of the water of the oceans depending upon differences of specific gravity'.

The debate ended somewhat acrimoniously and far from satisfactorily. The modern view (e.g. Sverdrup, Fleming & Johnson, 1942) is that no one simple model in isolation can explain the dynamics of ocean circulation. Rather, it is seen as due to the dynamic interaction of a large number of variable forces and as resulting in a complex series of inter-related movements. We can thus perhaps excuse Carpenter and Croll their simplistic models, which at least accounted for some of the phenomena observed by their time.

Life in the Deep Sea

As recently as the 1840's, Edward Forbes, a lecturer in natural sciences, had stated quite categorically following the voyages of the *Beacon* in 1841 and 1842 that conditions below 300fm. were incapable of sustaining life. He saw this as due to the lack of light penetration at those depths, which meant that there could be no photosynthesis. This in turn meant that there could be no plant life and consequently therefore neither the oxygen nor the primary food source necessary for the sustenance of animal life.

Wyville Thomson, though, had cause to doubt Forbes's 'Azoic Theory'. He was aware of the findings of lowly life-forms at great depths during the voyage of the *Bulldog* in 1860 (Wallich, 1862) and had first-hand reports of the forms attached to the Bona submarine cable off Sardinia at a depth of 1000fm. from his Edinburgh colleague Fleeming Jenkin. He had therefore set sail in 1868 aboard the *Lightning* and in 1869 aboard the *Porcupine* to investigate for himself the possibility of life in the deep-sea, finding abundant evidence of it to depths of 600fm. off the Shetlands and Faeroes on the former cruise and to 2000fm. off Ushant on the latter. It was with the publication of the results of the voyages of the *Lightning* and *Porcupine* (Wyville Thomson, 1873) that Forbes's 'Azoic Theory' finally came to be discredited (Rice *et al.*, 1976; Mills, 1978, 1984; Rehbock, 1979; Rice, 1986).

Nonetheless, it still came as something of a revelation when *Challenger* discovered worm tubes from a depth of about 3000fm. in March 1873. These were identified by Willemöes-Suhm as Annelida. This, and subsequent similar discoveries, prompted Wyville Thomson to note that 'conditions of the bottom are not only such as to admit the existence of life, but are such as to allow of the unlimited extension of the distribution of animals high in the zoological series, and closely in relation to the faunae of shallower zones'. It was inevitable in the light of this finding that there would come to be developed a theory of abyssal circulation and regeneration of bottom waters.

Meanwhile, important observations were also being made on the surface-dwelling and intermediate faunae recovered by plankton tows. Murray was able to document for the first time the diurnal vertical migration of many species. He was also able to confirm that the planktonic foraminifera in surface waters (see Plate 3, p. 120) were of the same species as those comprising the bulk of the underlying sediments. Up until this time, it was only surmised and sometimes openly contested that the '*Globigerina* ooze' consisted essentially of planktonic rather than benthonic species.

Also of note was the finding that the abundance and diversity of planktonic foraminifera varied greatly with latitude. The diversity tended to be much lower in higher latitudes, and in the highest latitudes few if any specimens were found: here, the '*Globigerina* ooze' passed into diatom ooze.

Particularly noteworthy was the following observation, probably the first on any living planktonic foraminifer, by Wyville Thomson (1877):

> On one occasion in the Pacific, when Mr. Murray was out in a boat in a dead calm collecting surface creatures, he took gently up in a spoon a litle globular gelatinous mass with a red centre and transferred it to a tube. The globule gave us our first and last chance of seeing what a pelagic foraminifer really is when in its full beauty. When placed under the microscope it proved to be a *Hastigerina* in a condition wholly different from anything we had yet seen. The spines, which were mostly unbroken, owing to its mode of capture, were enormously long, about fifteen times the diameter of the shell in length; the sarcode, loaded with yellow oil-cells, was almost all outside the shell, and beyond the fringe of yellow sarcode the space between the spines to a distance of about twice the diameter of the shell all round was completely filled up with delicate bullae . . . as if the most perfectly transparent portion of the sarcode has been blown out into a delicate froth of buttles of uniform size. Along the spines fine double threads of transparent sarcode, loaded with white granules, coursed up one side and down the other, while between the spines independent thread-like pseudopodia ran out, some of them perfectly free and others anastomosing . . . , but all showing the characteristic fluid movement of living protoplasm. The [accompanying] woodcut [based on drawings by Wild, the originals of which are now among the *Challenger* MSS. in the Special Collections Department of Edinburgh University Library], excellent though it is, gives only a most imperfect idea of the complexity and the beauty of the organism with its swimming or floating machinery in its expanded condition.

In the deeper parts of the Pacific (below about 4000fm.) in 1875 a new type of sediment was discovered. As this was a type of red clay but contained a high proportion of siliceous radiolarian sclerocoma, it came to be termed radiolarian ooze. Working on this material led incidentally to the solution of the mystery surrounding *Bathybius*. *B. haeckelii* had orginally been described by Huxley in 1868 from samples collected by the *Cyclops* and preserved in spirit. It was regarded as a form of protoplasm and at the time was central to the debate on abiogenesis or spontaneous generation of life from mud. Wyville Thomson, with Buchanan's help, demonstrated apparently conclusively that it was of mineral origin and represented an artefact of preparation technique (a precipitate in spirit of the calcium sulphate in sea water). Latterly, Rice (1983) has put forward a possible alternative hypothesis, envisaging *Bathybius* as an aggregated mass of phytoplankton bound by an amorphous matrix.

Achievements of the Expedition

From the point of view of increasing knowledge of the nature and distribution of deep-sea sediments, the voyage of the *Challenger* was hugely successful. Pioneer work by Buchanan and especially Murray opened up an almost entirely new field which Murray was to make peculiarly his own.

Despite primitive sampling methods, the biological aims of the cruise were also amply fulfilled. A tremendous amount of material was collected from trawling stations from all over the world and from dredging stations to the greatest depths ever sounded. This material had been sorted, where necessary preserved and classified into the main systematic groups for further analysis, identification and description. For this further study, Wyville Thomson carefully recruited seventy-six acknowledged international specialists, who for their services received a small honorarium to cover their expenses, a commemorative *Challenger* medal and eventually a personal copy of the report in which their results were published: many appear also to have acquired or sent to their colleagues duplicate sets of specimens!

About half of the species described (including about a quarter of the foraminifera) proved to be entirely new to science. Not only was this taxonomic synthesis invaluable in its own right, it permitted ecological analysis on an ocean—or world-wide basis for the first time. The deep-sea fauna proved to be remarkably cosmopolitan. Wyville Thomson was able to note that it bore close affinities to the shallower water fauna of high latitudes, 'no doubt because the conditions of temperature, on which the distribution of animals mainly depends, are nearly similar [in the two types of environment]'. Also that its relations with Tertiary and newer Mesozoic faunae were much closer than those of the faunae of shallow water, though not as close as he had been led to expect.

Only in the area of physical oceanography did the voyage fail to achieve wholly satisfactory results, though even here it fuelled debate and encouraged further study. Of all the criticisms that have been levelled at it, the most telling was that it did not incorporate a physicist. As it was, it was left to the chemist Buchanan to make whatever measurements he could of density, salinity and dissolved oxygen. Instruments such as the current drogue and reversing thermometers were certainly not used to their full potential. It was Buchanan, too, who was able to demonstrate by obtaining from his piezometers indirect but independent temperature values that the Miller-Casella readings were inaccurate. In view of this finding, and of the crucial importance of temperature in the debate on oceanic circulation, all earlier data had to be reassessed. It was therefore not until 1877, when Wild's book *Thalassa* was published, that the physical results of the *Challenger* cruise were adequately synthesised.

Contemporary opinions on the value of the *Challenger* expedition were divided. One rather bitter contemporary British commentator wrote, in an article reproduced in the journal *Hydrospace* in December, 1971:

> The first volume recording the adventures of the *Challenger* yachting trip is now out, and the other fifty-nine will be ready in less than a century. Everyone knows that Mr. Lowe sent a man-of-war laden with Professors, and that these learned individuals amused themselves for four years. They played with thermometers, they fished to all depths from two feet to three miles, they brought up bucketfuls of stuff from the deep-sea bottom, and they plottered about and imagined they were furthering the Grand Cause of Science. Then the tons of rubbish were brought home, and the genius who bossed the expedition proceeded to employ a swarm of foreigners to write monographs on the specimens. There were plenty of good scientific men in England, but the true philosopher is nothing if not cosmopolitan; so the taxpayers' money was employed in feeding a mob of Germans and other aliens. The whole business has cost two hundred thousand pounds; and in return for this sum we have got one lumbering volume of statistics, and a complete set of squabbles which are going on briskly wherever two or three philosophers are gathered together. I believe the expedition discovered one new species of shrimp, but I am not quite sure.

In contrast, a letter (now among the *Challenger* MSS. in the Special Collections Department of Edinburgh University Library) signed by the Austrian scientist Suess and several of his colleagues, dated 12 June 1876 and addressed to 'The Editors of the Periodical *Nature*, London', reads:

> Gentlemen, After having followed the reports of the Naturalists of H.M. Ship Challenger with the utmost interest we beg leave to ask you kindly to transmit this simple but sincere expression of a hearty welcome and of thankful admiration to those distinguished gentlemen, as well as to the officers and

crew of this gallant ship which has been called to render so prominent services to science.

The consensus of current opinion (as apparent from retrospective reviews written in commemoration of the *Challenger* centenary (Deacon (1971, 1972), Linklater (1972), Yonge (1972) & Charnock (1973)) is that the *Challenger* expedition was one of the most significant in the history of science.

'Reports of the Scientific Results of the Voyage of H.M.S. Challenger'.

The publication of the *Reports of the Scientific Results of the Voyage of H.M.S. Challenger* was the joint responsibility of the series editor and the Treasury. Wyville Thomson was the editor until his resignation on the grounds of ill health at the end of 1881, whereupon Murray was appointed as successor. Treasury parsimony then led to Murray drawing on his own personal fortune to finance the publication of the fifty lavishly-illustrated royal quarto *Challenger* volumes to appear between 1880 and 1895. these included a *Narrative of the Cruise: a General Account of the Scientific Results of the Expedition* by Murray, Buchanan, Moseley and Staff-Commander Tizard, published in two parts in 1885, and six other volumes to which Murray contributed personally.

Incidentally, the cost of the whole enterprise (estimated at one hundred and seventy thousand pounds sterling) was more than offset by the profits brought about by the exploitation of the phosphate deposits of Christmas Island in the Indian Ocean. These had been discovered quite by chance in 1886 by the *Flying Fish*, on a cruise which had been organised by Murray for the purpose of increasing knowledge of coral reefs. When Murray heard about the discovery from the Commanding Officer of the *Flying Fish* who had served with him on the *Challenger*, he was quick to turn unexpected good fortune to greater advantage. He promptly hired the geologist H. P. Guppy to conduct a detailed survey, and, when he found out that the phosphate deposits were of commercial importance, urged annexation of the island and its valuable resources to Great Britain. On 4 April 1888, he wrote a letter (which survives to this day in the Palaeontology Library of the British Museum (Natural History) and makes interesting reading) to Sir Henry Thurston Holland, Secretary of State for the Colonies, on this subject, and in June of that year, the *Imperieuse* landed on Christmas Island and hoisted the Union Flag there.

Murray, ever astute in matters of business, then helped to found the Christmas Island Phosphate Company, which, as the Admiralty Hydrographer later wrote 'provided ... more than the whole cost of the Challenger expedition'. After the death of co-founder Irvine, some of the company's profits were used to set up the Irvine Chair of Bacteriology at Edinburgh University which is still in place to this day.

This illuminating episode in Murray's life is chronicled in an article that appeared in the *Scotsman* of 8th March 1914 entitled 'Christmas Island: Fortune from a No-Man's Land'.

HENRY BOWMAN BRADY (1835–1891)

Henry Bowman Brady (see Plate 4) was born on 22 February 1835 in Gateshead in the North-East of England, where his parents had settled in 1829. His father, also called Henry (1805–1883) was a respected medical practitioner and surgeon: he was also, as his

Plate 4 **Top left:** Brady as a young man, probably c. 1868–1870. **Top right:** Brady as an older man. This is the best-known photograph of Brady, and is the one used by Adams (1978) in his recent biography. **Bottom left:** Jones. **Bottom right:** Parker. From the Brady Family Photograph Album. Reproduced by kind permission of Newcastle-upon-Tyne City Libraries & Arts.

biographers (his son-in-law and daughter) T. C. and H. B. Watson in Steel (1899) put it, 'emphatically a Christian physician' who had 'yielded to a call to the ministry' in 1861 and was a member of the Religious Society of Friends (Quakers), offering prayer with 'marked reverence and fervency' and inculcating in his children moral values which remained with them throughout their lives. His mother, Hannah (1802–1872), daughter of Ebenezer and Ann Bowman of One Ash Grange, Derbyshire (where the Brady family spent its summer holidays) was an 'active worker in many of the charitable agencies of Gateshead'. His elder brother, George Stewardson (1832–1921) went on to occupy the Chair of Natural History at the University of Durham and to achieve international recognition for his work on the Ostracoda (see, for instance, Davis & Horne, 1985). He had seven other brothers and sisters, including Thomas, who was born in 1837 and whose descendants survive to this day (he never himself married).

The young H. B. Brady no doubt had an interest in natural history fostered by his father (a keen amateur naturalist), by Tuffen West (an apprentice of his father's who was involved in dredging expeditions supported by the British Association in the 1860's and later achieved fame as an illustrator of zoological monographs), by the teachers in the two Quaker schools at which he was educated (Ackworth and Tulketh Hall near Preston), and by John Storey (a teacher, botanist and Secretary to the Tyneside Naturalists' Field Club from 1849–1857) and various other members of the colony of naturalists which had its headquarters in the North-East of England for many generations (Albany and John Hancock, Bewick and Alder among them).

It was evidently a lifelong interest: one of Brady's many letters to Dr. A. Gunther, Keeper of Zoology in the British Museum (Natural History), (now in the archives of the General Library of that institution), dated 19 November 1878, concerned Ant-Eaters. Another letter to Gunther, headed Devonshire Club, St James's SW and dated 6 May 1887, reads:

> You were so kind as to tell me some time ago that if I desired tickets for the Zoological Gardens I need not hesitate to ask you. Can you provide me with three tickets for Sunday week, May 15th—I have a niece in town who would be much pleased by the attention.

Brady left school in 1850 at the age of fifteen to serve as an apprentice to a Mr. T. Harvey or R. Richards (sources differ), a chemist in Leeds, for four years. He then went on to study pharmacy in the laboratories of Dr. T. Richardson, the forerunner of the Newcastle College of Medicine. On graduating in 1855, he set himself up as a wholesale and retail pharmacist on the corner of St. Nicholas' Square in Newcastle. His commercial career prospered from the start, possibly because pure drugs had previously been in short supply. He was soon able to move to larger premises in Mosley Street and to diversify into the export trade and into the sale of scientific instruments. In the latter function, he established important contacts with many eminent scientists. His ready acceptance by the inner sanctum of late nineteenth-century foraminiferologists may have been attributable in some measure to his business reputation.

Brady's dynamic energy and organisational ability were both evident in his role as pharmacist. He was largely responsible for the foundation of the British Pharmaceutical Conference and was an active member thereof, serving both as Treasurer (1864–70) and later President (1872–73). He also served on the Council of the Pharmaceutical Society and was a member of the Board of Examiners until 1870 (when ill-health forced him to retire). Further, he did much to promote the scientific education of pharmaceutical chemists and was instrumental in transforming the *Pharmaceutical Journal* (to which he was a regular contributor) from a monthly to a weekly publication. Accolades from professional colleagues were many. Brady was elected an Honorary Member of the

American Pharmaceutical Association, the Philadelphia College of Pharmacy and the Pharmaceutical Societies of St. Petersburg and Vienna.

His hunger for intellectual activity also manifested itself in fields other than those directly associated with his work, even early on. He became an enthusiastic member of the Tyneside Naturalists Field Club (incidentally the second oldest in the country) and the Northumberland, Durham and Newcastle-upon-Tyne Natural History Society. His first papers on the foraminifera appeared in the 1860's in the transactions of these societies and as a report of the British Association for the Advancement of Science (Brady, 1863, 1864a–b, 1865a–b) and essentially concerned those living off the coasts of his native North-East (see also Woodward, 1972). Another significant milestone in Brady's early career was the co-publication with Carpenter (Carpenter & Brady, 1869) of a monograph of the genera *Loftusia* and *Parkeria* (the latter now known to be non-foraminiferal). This work received extremely favourable reviews from Duncan and Parker, the originals of which are now to be found among the Referees Reports in the Archives of the Royal Society. It is testimony to Brady's dedication that over thirty subsequent publications on the group (ranging in age from Silurian to Recent) were forthcoming during the course of his working life, notwithstanding the many and varied demands on his time. In recognition of his signal services to natural science he was elected a Fellow of the Geological Society in 1864 and a Fellow of the Royal Society in 1874. In a letter headed Mosley St., Newcastle-on-Tyne and dated 6 June 1874, Brady wrote to Stokes at the Royal Society acknowledging the latter honour and adding 'I hope to be attending for admission on the 18th Sept.'. This letter now resides among the Miscellaneous Correspondence in the Archives of the Royal Society.

Brady was so successful in business that he was able to sign over his business to his one-time assistant and later partner Nicholas Martin in 1876 (at the age of 41) and to devote the remainder of his fruitful life to the full-time study of the foraminifera. In his work on the group, he was variously associated with most of the leading contemporary authorities, including his sometime co-authors Carpenter (see Plate 1), William Kitchen Parker and Thomas Rupert Jones (see Plate 4; see also Murray, 1981, 1989). Together with Fortescue William Millett and William Crawford Williamson, these luminaries constituted what was to become known as the 'English School'. The broad species concept of the taxonomically conservative 'English School' contrasted radically with the philosophy of the 'Continental School' (personified by Auguste Emanuel Reuss, Christian Gottfried Ehrenberg (see Plate 5), Alcide Dessalines d'Orbigny and others).

The pinnacle of Brady's achievements as a foraminiferal worker was undoubtedly achieved with the publication of the *Report on the Foraminifera dredged by H.M.S. Challenger During the Years 1873–1876* (hereafter *Challenger Report*). Brady's work on this colossal project began in 1878 and ended with the submission to the publishers of the final instalment in 1884. The 814 pages of text (written in a delightfully idiosyncratic style far removed from the modern terseness) set new standards of comprehensive presentation of information and attention to detail and make the *Challenger Report* an indispensable reference even to this day. The bibliographic section alone occupies 46 pages! Brady's accuracy of observation was particularly exemplary and is perhaps his most enduring legacy. He personally supervised the production of the 116 magnificent colour plates by the skilled draughtsman and lithographer A. T. Hollick, which are of a standard rarely matched before or since. Records in a plate proof receipt and despatch book owned by James Chumley of the *Challenger* Office, 45 Frederick Street, Edinburgh (now in the Special Collections Department of Edinburgh University Library) indicate that this in itself was a very time-consuming task, beginning in 1882.

In later life, Brady received many prestigious awards and honours for his contributions to foraminiferal studies, among them a gold medal from the Austrian Emperor Franz Joseph I (see below) and an honorary doctorate from the University of Aberdeen. The

Plate 5 **Left:** Ehrenberg. **Centre:** Reuss. **Right:** Karrer. From the Brady Family Photograph Album. Reproduced by kind permission of Newcastle-upon-Tyne City Libraries & Arts.

letter advising him of the latter honour is among some of the uncatalogued Brady papers in the Library of the Royal Society. It is dated 3 March 1888 and signed H. Alleyne Nicholson and reads 'My Dear Brady, I write a most hurried note in order to catch the early Sunday mail tomorrow morning for the south, that I may have the great pleasure of telling you that the University of Aberdeen has to-day, on my proposal, conferred upon you the degree of LL.D.'. He was also appointed as Corresponding Member of the Imperial Geological Institute of Vienna, made an Honorary Member of the Royal Bohemian Museum, Prague and sat on the 'Committee of Papers' of the Royal Society. His review of 3 June 1889 of a paper by Bateson 'on some varieties of *Cardium edule*' resides among the Referees Reports in the Archives of the Royal Society.

Like many other products of his generation, Brady had a great zest for life. Despite (or perhaps because of) his delicate health (he was troubled by pulmonary disease for many years), he was an avid gentleman-traveller. He journeyed twice around the world, visiting such places as Morocco, India, Ceylon, China, Japan, Java, the Pacific Islands, Australia, New Zealand and the United States. He seems to have been particularly fascinated by the Orient, and filled the house he had bought for his father's retirement ('Hillfield' at the top of Windmill Hill in Gateshead) with Japanese paintings, vases and curios.

His interest in the local flora and fauna he encountered and the native customs he observed on his travels frequently prompted him to write short pieces. One of his letters to Gunther, headed Hillfield and dated 28 October 1878, reads:

> During a recent visit to the interior of Morocco, I made a good many observations in respect to the snake performances as practiced by the Clissowa.

A subsequent letter, dated 13 November 1878, thanks Gunther for his '. . . obliging letter just to hand . . .', and laments the lack of '. . . accurate knowledge on the characters of snakes . . .' displayed earlier, adding: '. . . had they only been Protozoa, I could have told you more about them—but this comes from having lapsed into a specialist'.

On his last overseas trip, to the Upper Nile in 1889–1890, Brady fell seriously ill with oedema of the feet and legs. He spent some time laid up in Cairo before being forced home. On his return, he took up residence in Bournemouth, where he lived as a semi-invalid and was unable to fulfil his final ambition (alluded to in a letter to Gunther dated 22 May 1888) of producing a monograph of the British Foraminifera.

Brady died of pneumonia on Saturday 10 January 1891. The *Newcastle Daily Chronicle* posted a short obituary notice the following Monday, and an account of the funeral the following Thursday. Obituaries were also published in the *Geological Magazine*, in the *Pharaceutical Journal* and in the 'Notices of Fellows Deceased' in the *Proceedings of the Royal Society* for 1891–1892 (the last-named by the metallurgist W. C. Roberts-Austen).

Brady's most fitting epitaph is provided by Dr. Michael Foster, who wrote in the issue of *Nature* dated 29 January 1891:

> Science has lost a steady and fruitful worker, and many men of science have lost a friend and helpmate whose place they feel no-one else can fill. His wide knowledge of many branches of scientific inquiry and his large acquaintance with scientific men made the hours spent with him always profitable; his sympathy with art and literature, and that special knowledge of men and things which belongs only to the travelled man made him welcome also where science was unknown; while the brave patience with which he bore the many troubles of enfeebled health, his unselfish thoughtfulness for interests other than his own, and a sense of humour which, when needed, led him to desert his usual staid demeanour for the merriment of the moment, endeared him to all his friends.

Readers interested in further details of Brady's life are referred to the two fine and factual biographies known to the author, the one contemporary (by his brother-in-law Thomas Carrick Watson, in Steel, 1899), the other modern (Adams, 1978).

Brady Library

Watson, the executor of Brady's will, wrote to the Treasurer of the Royal Society in a letter (now among the Miscellaneous Correspondence in the Archives of the Royal Society) headed 83 Osborne Road, Newcastle-upon-Tyne and dated 2 July 1891: 'I beg to hand you herewith ... eight hundred pounds, being the sum bequeathed by the late Henry Bowman Brady to the Royal Society.'

Five hundred pounds was to be placed in the Scientific Relief Fund of the Royal Society in accordance with Clause 10 of the will. The remaining three hundred pounds was to be used for the maintenance and increase of the Brady Library in accordance with Clause 3 of the will, which read:

> I bequeath all my books and papers relating to the Protozoa to the Royal Society and I recommend for the greater convenience of reference thereto the said books and papers should be kept together in one place and a distinct collection ....

The Brady Library, incidentally the only named collection in the entire Library of the Royal Society (though currently in the basement!) now comprises some 180 volumes. Among these are a number of rare and valuable books by such authors as Agassiz, d'Archaiac & Haime, Batsch, de Blainville, Costa, Dujardin, Ehrenberg, Fichtel &

Moll, Geinitz, Haeckel, Karrer, Karrer, d'Orbigny, Schaudinn, Seguenza, Silvestri, Soldani, Spengler, Stache & Schwager and Terquem. Also in the collection are a complete early run of the journal *Annals and Magazine of Natural History* and volumes of reprints and unpublished manuscripts and drawings by various workers annotated by Brady himself, some of which are bound under the title *Memoirs and Papers Relating to the Foraminifera*. Some material has been bound and some added by the Royal Society.

Some letters, manuscripts and sundry papers are archived separately in the Library of the Royal Society.

The letters include one from Edward Heron-Allen to the Library Committee of the Royal Society, headed 33 Hamilton Terrace N.W. and dated 21 October 1914, which reads:

> Gentlemen, By the introduction of Prof. Herdman and with the kind and courteous assistance of the Asst. Librarian Mr. Hastings White, it has been my privilege for some time past to make use of the unique and remarkable collection of works on the Foraminifera bequeathed to your library by the late Dr. H. B. Brady . . .

Other letters in the collection include ones to Brady from G. S. Brady, Carter [?], Guppy, Halkyard, Hantken, Howchin, Millett, Murray, Schwager and Sherborn.

The manuscripts include one 'On the shallow water and littoral foraminifera of some of the islands of the southern Pacific', probably written c. 1890 and never published.

The sundry papers include numerous drawings and tracings of foraminifera by Brady together with a key, plates of Crag foraminifera by Brady and West, taxonomic notes on Pacific foraminifera (New Caledonia, 1884, Fiji, 1884–1885 and Samoa), and distribution data on the *Challenger* foraminifera.

The *Challenger* data are contained in three black foolscap volumes. Two of these tabulate the distributions of all of the species of foraminifera figured in the *Challenger Report* (Brady, 1884), species-by-species. The first of these deals with those figured on Plates 1–55 of the *Challenger Report* (Miliolidae-Astrorhizidae-Lituolidae-Textularidae-Chilostomellidae) and the second with those figured on Plates 56–115 (Lagenidae-Globigerinidae-Rotalidae-Nummulinidae). The tables are interspersed with notes (e.g. from Rev. A. M. Norman on *Psammatodendron*). The third volume lists the distributions of all of the foraminifera figured in the *Challenger Report*, station-by-station, and adds the date on which the station was sampled, its latitude and longitude, and depth, bottom temperature and substrate data. This volume contains an unsigned note to the effect that 'Brady gives lists from . . . stations not in his Report'.

Brady Family Photograph Album

Additional insights into the Brady's shared characters may be gained by browsing through their family photograph album in the Local Studies Department, Central Library, Newcastle-upon-Tyne. The frontispiece page features one of the best-known photgraphs of Brady (that used by Adams (1978); see also Plate 4) and dedicates the album to his 'affectionate remembrance'. Many of the photographs in this remarkable and fascinating compilation were evidently taken by Brady himself: a number of the earliest ones of the Great Fire of Gateshead are dated October 1854 and signed H. B. B., and it seems reasonable to attribute some later photomicrographs (including ones of pennate and centric diatoms and holothurians) to him also. However, some were also taken by R. B. Bowman (probably a cousin) and some evidently bought as postcards, etc.

Among the photographs present in the album (this is by no means an exhaustive list) are ones of local scenes, beauty spots (home and abroad), still lives, staged set-pieces somewhat in the style of Henry Peach Robinson, family and friends (including the Quaker families Pumphrey and Robinson), literary figures (contemporary English and French authors and the Romantic Poets), works of art (principally in the classical, neo-classical, renaissance and Pre-Raphaelite schools and often with a religious theme) and architecture (principally ecclesiastical, but also industrial and municipal), contemporary figures, politicians and captains of industry (including such diverse figures as the performing artists Ellen Terry and Sarah Siddons, Florence Nightingale and the 'iron master' Crawshay, David Livingstone and the imperialist Rajah Brooke, abolitionist Abraham Lincoln and the Tsar of Russia, the Pope and Garibaldi) and leading contemporary scientists and naturalists. A touching chord is struck by the inclusion of the obviously much-loved prize-winning dog 'Cato', and a somewhat bizarre one by the inclusion of one 'Crockett the Lion Tamer'.

THE *CHALLENGER* FORAMINIFERA

The 600 cases of *Challenger* material, including 100,000 'mountable specimens' were originally assumed all to have been deposited in the British Museum (Natural History), in accordance with Admiralty instructions to that effect. However, some material was disposed of during the voyage, some was never returned by the specialists to whom it was sent for description and some was sent out on subsequent request to various institutions: in particular, sediment samples were very widely dispersed.

The history of dispersal of the *Challenger* material is admirably summarised by Lingwood (1981) and Kempe & Buckley (1987). The following discussion of the location of *Challenger* foraminiferal material is based partly on these accounts, and partly on those of Adams (1960), Adams *et al.* (1980) and Murray & Taplin (1984*a*). McConnell (in press) provides further information on the whereabouts of correspondence and papers pertaining to the *Challenger* expedition and its organisers and participants.

Foraminiferal Slides

According to records in the catalogue of '*Challenger* Office specimens sent out 1873–1915' housed in the Palaeontology Library of the British Museum (Natural History), *Challenger* material was sent to Brady in ten batches between 25 November 1882 and 9 September 1887, that despatched on 1 June 1887 being directed to 5, Robert Street, Adelphi, London WC1. This material is only recorded as having been returned in three instances! However, it would seem that little of importance remains unaccounted for.

Most of the specimens of foraminifera figured in the *Challenger Report* (Brady, 1884) are to be found in picked slides in handsome polished wood cabinets in the Heron-Allen Library in the Palaeontology Department of the British Museum (Natural History) (see Plate 6); a few are to be found in the Carpenter collection in the Royal Albert Memorial Museum, Exeter (Murray & Taplin, 1984*a*). The slides in the BM(NH) pertain to the cruises of the *Challenger* herself (1872–1876), the *Lightning* (1868), the *Porcupine* (1869) and the *Knight Errant* (1879) and to the Austro-Hungarian and British North Polar expeditions (1872–74 and 1875–76 respectively). Comparison with authenticated specimens of Brady's handwriting (e.g. signed letters to Gunther and to John Hancock (now in the museum that bears his name in Newcastle-upon-Tyne)) suggests that the

Victorian copper-plate inscriptions on the bottoms of many of these slides are attributable to the man himself.

Unfigured but sorted specimens and unpicked and unsorted residues are also to be found in slides in the Palaeontology Department of the BM(NH) (see Plate 6). Henry Sidebottom made some attempt to catalogue the former in his unpublished 'MS. index to the collection of type-slides used by H. B. Brady . . .', probably compiled at around the turn of the century. Adams (1960) and Adams *et al.* (1980) list the BM(NH) registered numbers of many of the specimens figured in the *Challenger Report* (Brady, 1884). They also discuss the status of the specimens of the 97 species described as new in the *Challenger Report* (Brady, 1884) and the 140 species described as new in earlier works (principally Brady, 1878, 1879*a–b*, 1881a–c, 1882) and subsequently figured (in many cases for the first time) in the *Challenger Report*. All of these are interpreted as syntypes. Some have been designated as lectotypes and paralectotypes.

Adams and Adams *et al.* (*op. cit.*) also give something of the history of the collections. It appears from their accounts that Brady presented the *Porcupine* material to the BM(NH) in 1885 and the *Knight Errant* material and 612 slides of *Challenger* material in 1888. At least the bulk of the remainder of the *Challenger* material was originally deposited in the University Museum of Zoology, Cambridge, whence, at the instigation of Sir Clive Forster-Cooper and Edward Heron-Allen, it was removed to the BM(NH) between 1939 and 1959 (see also Joysey, 1960). There are no records of any material remaining at Cambridge (R. Symonds, personal communication).

In fact, Brady appears to have presented some *Challenger* material to the BM(NH) as early as 1885. A letter from Brady to Gunther, headed Savile Club, Piccadilly and dated 8 October 1885, intimated that Brady expected to finish the following day '. . . sorting and arranging the collection of Challenger and other Foraminifera and mounting a suitable series for exhibition [in the BM(NH)]'. A second letter, dated 9 October, confirmed that he had indeed '. . . finished, as far as I can at the moment, the work I have been engaged upon . . . in connection with the collections'. A third letter, headed White Hart Hotel, Reigate and dated 13 October, noted that Brady was '. . . well pleased that the series of Foraminifera meets with your approval. I hope still, as I may have time, to do a good deal to render it more complete'.

Brady is also known to have presented 435 slides of *Challenger* and *Porcupine* material and practically all of the Austro-Hungarian North Polar expedition material to his friend Felix Karrer (see Plate 5) at the Naturhistorisches Museum, Vienna, in 1887, which resides there still. In recognition of this, Franz von Hauer, a geologist who at the time was director of the Museum, approached the Austrian Emperor Franz Joseph I and arranged for Brady to be presented with a gold medal inscribed 'k. k. österr.–ung. Ehrenzeichen für Kunst und Wissenschaft' (Insignia of the Royal and Imperial Austro-Hungarian Empire for Art and Science) and bearing His Imperial Majesty's portrait and device (F. Rögl, personal communication).

Additional *Challenger* material was presented to David Robertson, 117 slides of which are now in the Robertson Museum and Aquarium collection, Millport, and Art Gallery and Museum collection, Glasgow (F. Woodward, personal communication). The Hancock Museum, Newcastle-upon-Tyne also has '. . . a few slides . . .' (P. S. Davis, personal communication), and the Laboratorium voor Paleontologie, Katholieke Universiteit, Leuven, Belgium, has twelve (Hooyberghs & van de Sande, 1988).

Raw Material

A vast number of sediment sounding samples collected by *Challenger* are now housed in the BM(NH). These were originally stored in one collection in the *Challenger* expedition

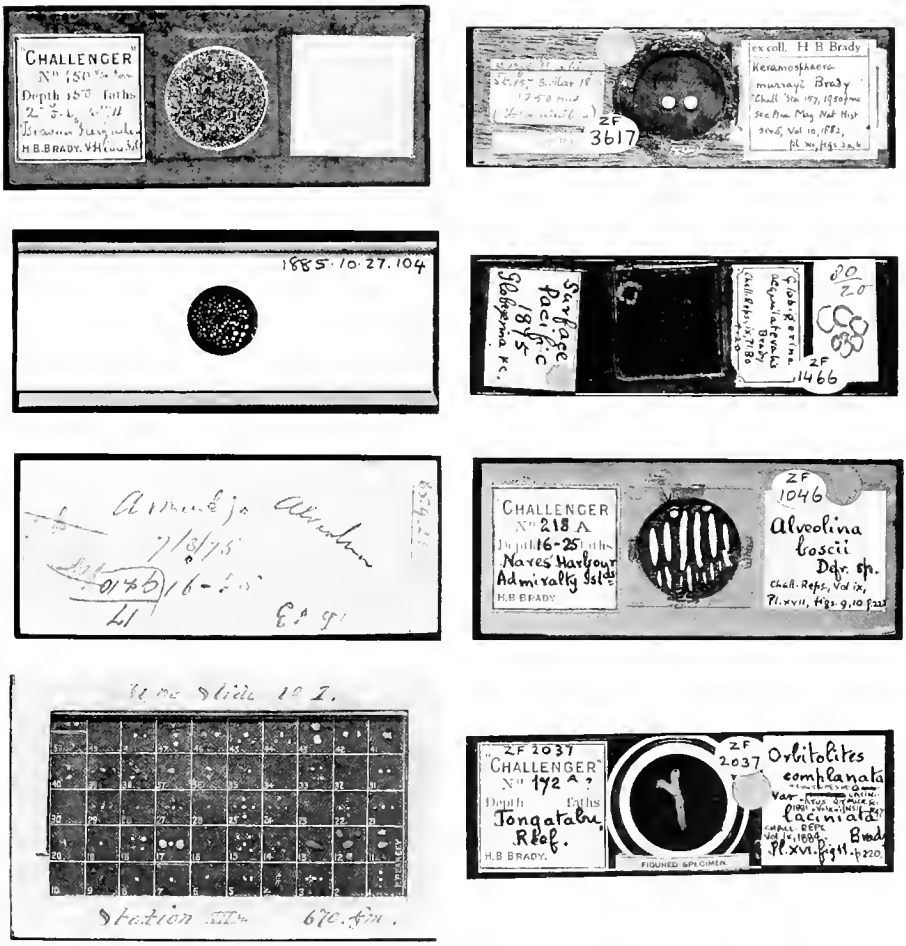


Plate 6 **Top left:** Slide of residue material from *Challenger* Station 150, between Kerguelen and Heard Island. **Upper middle left:** Slide of picked residue from *Challenger* Station 218A, Admiralty Islands (top), with old British Museum (Natural History) registered number (1885.10.27.104) **Lower middle left:** Bottom of same slide annotated by Brady. **Bottom left:** Slide of sorted residue from Station VIIIC. The fauna in many of these so-called 'type slides' has been identified by Sidebottom ('MS. index to the collection of type-slides used by H B. Brady . . .'). **Top right:** Slide of the benthonic foraminifer *Keramosphaera murrayi* Brady from *Challenger* Station 157, with new BM(NH) registered number (ZF3617). **Upper middle right:** Slide of the planktonic foraminifer *Globigerina aequilateralis* Brady [now identified as *Globigerinella aequilateralis* (Brady)] from a surface tow in the Pacific, with new BN(NH) registered number (ZF1466). Figured in the *Challenger Report* (Brady, 1884; Pl. 80, Fig. 20). **Lower middle right:** Slide of the benthonic foraminifer Alveolina boscii Defrance, sp. [now *Alveolinella quoyi* (d'Orbigny)] from *Challenger* Station 218A, Admiralty Islands, with new BM(NH) registered number (ZF1046). Figured in the *Challenger Report* (Brady, 1884; Pl. 17, Figs. 9–10). Bottom of same slide annotated by Brady, with old BM(NH) registered number (1885.9.25.11) **Bottom right** Thin-section slide of the benthonic foraminifer *Orbitolites complanata* var. *laciniata* Brady [now *Marginopora vertebralis* var. *plicata* Dana] from *Challenger* Station 172A, Tongatabu Reef, with new BM(NH) registered number (ZF2037). Figured in *Challenger Report* (Brady, 1884; Pl. 16, Fig. 11).

All reproduced by courtesy of the Palaeontology Department of the BM(NH)

commission's offices in Queen Street in Edinburgh, which was moved in 1890 to nearby Frederick Street. A set of samples from this collection, one from each *Challenger* station, was sent to the Geology Department of the BM(NH) in 1895 and subsequently transferred to the Zoology Department of that institution in 1922 and to the Mineralogy Department in 1938. The remainder of the Edinburgh collection was transferred in 1904 to Sir John Murray's residence 'Villa Medusa' on the northern outskirts of the city, where it remained until long after Murray's death in an automobile accident in 1914. Here it was examined by Edward Heron-Allen and Arthur Earland in 1919 and found to comprise 9746 samples of 'Marine Deposits' (soundings, dredging, etc. in bottles and boxes), together with the *Challenger* expedition glass photographic plates, microscopical preparations and an extensive oceanographic library. This part of the collection was eventually acquired by the Zoology Department of the BM(NH) in 1921 and by the Mineralogy Department either later in 1921 (a few specimens of phosphates, etc.) or in 1935. Some of it has subsequently been transferred to the Palaeontology Department.

Murray had stipulated in 1914 to Heron-Allen that in the event of his untimely death his collection should be bequeathed either to his two sons, if they wished to carry on his work, or to a reputable institution such as the BM(NH) or to the Imperial College of Science (University of London). In the latter event a responsible curator, salaried from a trust fund, was meticulously to catalogue every sample. After the inevitable delay, this condition (subsequently stressed by the Murray family solicitor) has now been fully complied with: the Sir John Murray Collection of zoological, botanical and geological specimens from the cruise of H.M.S. *Challenger* is catalogued by Buckley *et al.* (1979, 1984) and most of it has been entered onto a computer database.

PLANNED REVISION TO THE TAXONOMY OF THE *CHALLENGER* FORAMINIFERA

The original report on the *Challenger* foraminifera (Brady, 1884) dates from what might best be termed the systematic or descriptive phase of deep-sea research. It was conceived in the pervasive intellectual atmosphere of the 'English School' and consequently embodies a broader ('lumping') species concept than is usually acceptable today (Cifelli & Richardson, 1990; Haynes, 1990). Because of its archaic taxonomy, it cannot be used without qualification in the type of analytical and synoptic work currently being undertaken.

Previous revisions to the taxonomy of the *Challenger* foraminifera include those of Nuttall (1927, 1931), Thalmann (1932, 1933, 1937, 1942) and most notably, R. Wright Barker (1960). Barker's work was particularly important and useful in that it synthesised all of the great variety of names assigned to Brady's figured species in the literature up to 1960 (including those of Nuttall and Thalmann, *opp. cit.*) However, Barker did not subjectively assess which names were valid and which not, referring simply to the '... return in ... recent times to the principles of Reuss ...', the 'splitting of a large number of Brady's "species" ...' and '... their allocation to new genera ...'. He proposed *nomina nova* for four species whose earlier names were pre-occupied, but did not formally describe the thirty-one species and three varieties he regarded as new, stating that 'a number of the forms figured by Brady, and as yet undescribed, have been indicated but have not been named, for the writer has not had the opportunity to study Brady's specimens in order to prepare adequate descriptions and to designate types.' And in many cases he left problems of generic assignment unresolved, commenting in the case of the nodosariids, for instance, that 'there is still confusion in the treatment of this group, ... and no attempt has been made to clarify the question here, the generic

names in all cases being quoted unchanged'. His work was essentially, as he himself stated, '. . . of a bibliographic nature and in no sense a critical revision of the *Challenger Report*.'

Since Barker's time there have been a large number of publications bearing on the taxonomy of the *Challenger* foraminifera: some of the more important are those of Loeblich & Tappan (1964, 1988), Shchedrina (1964, 1969), Srinivasan & Sharma (1969, 1980), Hornibrook (1971), Saidova (1975, 1981), McCulloch (1977, 1981), Zheng (1979), Haynes (1981), Rögl & Hansen (1984), Papp & Schmid (1985) and Van Morkhoven, Berggren, Edwards *et al.* (1986).

In my opinion, the taxonomic advances since Barker's time allow a fresh revision of the taxonomy of the *Challenger* foraminifera, while the growing interest in cosmopolitan deep water benthonic foraminifera and their stratigraphic, palaeobathymetric and palaeo-oceanographic potential necessitates it.

I am therefore planning a further revision of the taxonomy of the *Challenger* foraminifera. My intention is to reproduce all of the text-figures and 116 colour plates from the original report on the *Challenger* foraminifera (Brady, 1884) in book form and to annotate them with up-to-date taxonomic notes. Identifications will be based on examination of the specimens themselves in the British Museum (Natural History). Locations and depths of sampling sites from which figured specimens came will be checked at source and given in full, as will BM(NH) registered numbers and relevant information on the status of specimens (lectotypes etc.). A list of cited references and a comprehensive taxonomic index will also be given.

ACKNOWLEDGEMENTS

Grateful thanks are due to Professor F. T. Banner of the BP Research Centre, Sunbury-on-Thames, and the Palaeontology Department of the British Museum (Natural History), London, to Drs C. G. Adams (recently retired) and J. E. Whittaker and Mr R. L. Hodgkinson also of the Palaeontology Department, to Mrs Eileen Brunton of the Palaeontology Library, to Mr H. A. Buckley of the Mineralogy Department and to the staff of the General Library of the BM(NH); to Mr P. S. Davis and the staff of the Hancock Museum, Newcastle-upon-Tyne; to Mr J. V. Howard and the staff of the Speeial Collections Department, Edinburgh University Library; to Mr F. Manders and the staff of the Local Studies Department of the Central Library, Newcastle-upon-Tyne; to Mr K. Moore of the Royal Society, London; to Dr A. L. Rice of the Institute of Oceanographic Sciences Deacon Laboratory, Wormley, Surrey; to Dr F. Rögl of the Palaeontology Department of the Naturhistorisches Museum, Vienna, Austria; to Mrs Ann Shirley of the Ships Department of the National Maritime Museum, Greenwich, London; to Mr R. Symonds of the University Museum of Zoology, Cambridge; to Mr F. Woodward of the Natural History Department of the Museum and Art Gallery, Kelvingrove, Glasgow. Extracts from papers in the Archives of the Royal Society are reproduced by kind permission of the President and Council of that Institution. The National Maritime Museum gave permission to reproduce the photographs of H.M.S. *Challenger*. Edinburgh University Library gave permission to reproduce the photograph of the *Challenger* crew, Gulland's pen-and-wash sketch of Wyville Thomson and Buchanan and Wild's original drawing of *Globigerina bulloides* d'Orbigny. Newcastle-upon-Tyne City Libraries and Arts gave permission to reproduce the photographic portraits from the Brady family album. The photographs of the *Challenger* slides appear courtesy of the Palaeontology Department of the BM(NH).

Pippa Senior, Press Officer of the Royal Society and coincidentally a descendant of the Brady family provided much valuable information on the Brady family genealogy, including a family tree. This had been compiled by her great grand-mother Nora Gillie, born Brady, who was Thomas Brady's daughter and one of Henry Bowman Brady's nine nieces.

My father also assisted with some of the biographical work. My wife Heather and my colleague Mike Simmons proof-read early draughts of the text and suggested various stylistic and scientific improvements.

Permission to publish was granted by the British Petroleum Company p.l.c.

CITED REFERENCES

Adams, C. G. 1960. A note on two important collections of foraminifera in the British Museum (Natural History). *Micropaleontology* **6**: 417–418.

—— 1978. Great names in micropalaeontology. 3. Henry Bowman Brady, 1835–1891. Pps. 275–280 *in* Hedley, R. H. & Adams, C. G. (Eds): *Foraminifera. Volume 3*. Academic Press; London, New York, San Francisco.

Adams, C. G., Harrison, C. A. & Hodgkinson, R. L. 1980. Some primary type specimens of Foraminifera in the British Museum (Natural History). *Micropaleontology* **26**: 1–16.

Barker, R. W. 1960. Taxonomic notes on the species figured by H. B. Brady in his Report on the Foraminifera dredged by H.M.S. *Challenger* during the years 1873–1876. Accompanied by a reproduction of Brady's plates. *Special Publications of the Society of Economic Paleontologists and Mineralogists*, Tulsa, Oklahoma **9**: 238 pps.

Boog Watson, W. N. 1967. Sir John Murray—a chronic student. *University of Edinburgh Journal* **23**: 123–138.

Brady, H. B. 1863. Report on the Foraminifera. Pps. 291–294 *in* Mennell, H. T. (Ed.): Report on the dredging expedition to the Dogger Bank and the coasts of Northumberland. *Transactions of the Tyneside Naturalists' Field Club* **5**.

—— 1864*a*. Notes on foraminifera new to the British fauna. *Reports of the British Association for the Advancement of Science* **1863**: 100–101; London.

—— 1864*b*. Report on the Foraminifera. Pps. 193–194 *in* Brady G. S. (Ed.): Report of Dredging Operations on the Coasts of Northumberland and Durham in July and August 1863. *Transactions of the Tyneside Naturalists' Field Club* **6**.

—— 1865*a*. Report on the Foraminifera. Pps. 51–83 *in* Brady, G. S. (Ed.): Reports of Deep Sea Dredging on the Coasts of Northumberland and Durham, 1862–4. *Transactions of the Natural History Society of Northumberland, Durham and Newcastle-upon-Tyne* Old Series **1**: 51–82.

—— 1865*b*. A catalogue of the Recent Foraminifera of Northumberland and Durham. *Transactions of the Natural History Society of Northumberland, Durham and Newcastle-upon-Tyne* Old Series **1**: 83–107.

—— 1878. On the Reticularian and Radiolarian Rhizopoda (Foraminifera and Polycystina) of the North Polar Expedition of 1875–76. *Annals and Magazine of Natural History* (5) **1**: 425–440.

—— 1879*a*. Notes on some of the reticularian Rhizopoda of the *Challenger* Expedition. 1. On new or little known arenaceous types. *Quarterly Journal of Microscopical Science* New Series **19**: 20–63.

—— 1879*b*. Notes on some of the reticularian Rhizopoda of the *Challenger* Expedition. 2. Additions to the knowledge of porcellaneous and hyaline types. *Quarterly Journal of Microscopical Science* New Series **19**: 261–299.

—— 1881*a*. Notes on some of the reticularian Rhizopoda of the *Challenger* Expedition. 3. 1—Classification, 2—Further notes on new species, 3—Note on *Biloculina* mud. *Quarterly Journal of the Microscopical Society* New Series **21**: 31–71.

—— 1881*b*. On some Arctic Foraminifera from soundings obtained on the Austro-Hungarian North Polar Expedition of 1872–1874. *Annals and Magazine of Natural History* (5) **8**: 93–418.

—— 1881*c*. Über einige arktische Tiefsee-Foraminiferen gesammelt während der österreichisch-ungarischen Nordpol-Expedition in der Jahren 1872–74. *Denkschriften der Kaiserlichen Akademie der Wissenschaften, Wien, Mathematisch-Naturwissenschaften Klasse* **43**: 9–110.

—— *in* **Tizard, Staff-Commander & Murray, J.** 1882. Exploration of the Färoe Channel during the Summer of 1880 in Her Majesty's Hired Ship '*Knight Errant*'. *Proceedings of the Royal Society of Edinburgh* **11**: 638–720.

—— 1884. Report on the Foraminifera dredged by H.M.S. *Challenger* during the years 1873–1876. *Report of the Scientific Results of the Voyage of H.M.S. Challenger, 1873–1876, Zoology* **9**: 814 pps. London.

Buckley, H. A., Elliot, C. J., Graham, N. M., Johnson, L. R., Kempe, D. R. C., Morgan, D. L. & Williams, D. B. 1979. *Catalogue of the ocean bottom deposits collection in the British Museum (Natural History)*. Part 1. British Museum (Natural History); London.

—— 1984. *Catalogue of the ocean bottom deposits collection in the British Museum (Natural History)*. Part 2. British Museum (Natural History); London.

Burstyn, H. L. 1968. Science and government in the nineteenth century: the Challenger expedition and its report. *Bulletin of the Institute of Oceanography, Monaco*, Special Issue **21**: 603–613.

—— 1972. Pioneering in large-scale scientific organisation: the *Challenger* expedition and its report. 1. Launching the expedition. *Proceedings of the Second International Congress on the History of Oceanography, Edinburgh, 1972 (Challenger Expedition Centenary Volume)*: 47–62.

Carpenter, W. B. 1862. *Introduction to the study of the foraminifera*. 319 pp. Ray Society; London.

—— 1883. Report on the specimens of the genus *Orbitolites* collected by H.M.S. *Challenger* during the years 1873–1876. *Report of the Scientific Results of the Voyage of H.M.S. Challenger, 1873–1876, Zoology* **7**: 47 pps. London.

Carpenter, W. B. & Brady, H. B. 1869. Description of *Parkeria* and *Loftusia*, two gigantic types of arenaceous foraminifera. *Philosophical Transactions of the Royal Society* **159**: 721–754.

Charnock, H. 1973. H.M.S. *Challenger* and the development of marine science. *Journal of Navigation* **26**: 1–12.

Cifelli, R. & Richardson, S. L., 1990. A history of the classification of foraminifera (1826–1933) Cushman Foundation for Foraminiferal Research, Special Publication, Washington D.C. **27**, 119pp.

Davis, P. S. & Horne, D. J. 1985. George Stewardson Brady (1832–1921) and his collections at the Hancock Museum, Newcastle-upon-Tyne. *Journal of Micropalaeontology* **4**: 141–152.

Deacon, M. 1971. The voyage of H.M.S. *Challenger*. Pps. 333–365 *in*: *Scientists and the Sea*, 1650–1900. Academic Press; London.

—— 1972. The Challenger Expedition and Geology. *Proceedings of the Second International Congress on the History of Oceanography, Edinburgh, 1972 (Challenger Expedition Centenary Volume)*: 145–154.

Haynes, J. R. 1981. *Foraminifera*. 433 pps. Macmillan, London.

Haynes, J. R. 1990. The classification of the foraminifera—a review of historical and philosophical perspectives. *Palaeontology* **33**: 503–528.

Herdman, Sir W. 1923. *Founders of oceanography and their work. an introduction to the science of the sea*. 340 pps. Edward Arnold & Co., London.

Hooyberghs, H. & van de Sande, G. 1988. Remarques sur une collection des foraminifères de quelques échantillons originaux de l'expédition du 'Challenger' (1873–1876), conservée a Leuven (Belgique). *Revue de Micropaleontologie* **30**: 261–266.

Hornibrook, N. de B. 1971. A revision of the Oligocene and Miocene foraminifera from New Zealand described by Karrer and Stache in the Reports of the 'Novara' Expedition (1864). *New Zealand Geological Survey, Paleontological Bulletin* **43**: 84 pps. Wellington.

Joysey, K. A. 1960. Note on the Brady Collection of Foraminifera. *Micropaleontology* **6**: 416.

Kempe, D. R. C. & Buckley, H. A. 1987. Fifty years of oceanography in the Department of Mineralogy, British Museum (Natural History). *Bulletin of the British Museum (Natural History)*, Historical Series **15**: 59–97.

Lee, S. (Ed.). 1898. *Dictionary of National Biography* Smith, Elder & Co; London.

Lingwood, P. F. 1981. The dispersal of the collections of H.M.S. *Challenger*: an example of the importance of historical research in tracing a systematically important collection. Pps. 71–77 in Wheeler, A. & Price, J. H. (Eds): History in the service of systematics. *Special Publications of the Society for the Bibliography of Natural History*, **1**, London.

Linklater, E. 1972. *The Voyage of the Challenger*. 288 pps. John Murray; London.

Loeblich, A. R., Jr. & Tappan, H. 1964. *Protista 2. Sarcodina, chiefly 'Thecamoebians' and Foraminiferida, Part C*. In Moore, R. C. (Ed.): Treatise on Invertebrate Paleontology. 2 vols. Geological Society of America and University of Kansas Press; Lawrence, Kansas.

—— 1988. *Foraminiferal Genera and their Classification*. 2 vols, Van Nostrand Reinhold Company; New York.

McConnell, A. 1981. *Historical instruments in oceanography*. 52 pps. Her Majesty's Stationery Office; London.

—— (Co-Ordinator). In press. Directory of source materials for the history of oceanography. *UNESCO technical papers in marine science*.

McCulloch, I. 1977. *Qualitative observations on Recent foraminiferal tests with emphasis on the Eastern Pacific*, 3 vols. University of Southern California; Los Angeles.

—— 1981. *Qualitative observations on Recent foraminiferal tests. Pt. IV: with emphasis on the Allan Hancock collection, North Atlantic*. University of Southern California; Los Angeles.

Mills, E. L. 1978. Edward Forbes, John Gwyn Jeffreys, and British dredging before the *Challenger* expedition. *Journal of the Society for the Bibliography of Natural History* **8**: 507–536.

—— 1984. A view of Edward Forbes, naturalist. *Archives of Natural History* **11**: 365–393.

Moseley, H. N. 1879. *Notes by a Naturalist. An account of observations made during the voyage of H.M.S. 'Challenger'*. 620 pps. MacMillan, London.

Murray, J. W. 1971. The W. B. Carpenter Collection. *Micropaleontology* **17**: 105–106.

—— 1981. Some Early Students of Foraminifera in Britain. Pps. 9–12 *in* Jenkins, D. G. & Murray, J. W. (Eds): *Stratigraphical Atlas of Fossil Foraminifera*. Ellis Horwood Ltd; Chichester.

—— 1989. Some Early Students of Foraminifera in Britain. Pps. 13–19 in Jenkins, D. G. & Murray, J. W. (Eds): *Stratigraphical Atlas of Fossil Foraminifera, Second Edition*. Ellis Horwood Ltd; Chichester.

Murray, J. W. & Taplin, C. M. 1984*a*. The W. B. Carpenter Collection of Foraminifera: a catalogue. *Journal of Micropalaeontology* **3**: 55–58.

—— 1984*b*. Larger agglutinated foraminifera collected from the Faeroe Channel and Rockall Trough by W. B. Carpenter. *Journal of Micropalaeontology* **3**: 59–61.

Nuttall, W. L. F. 1927. The localities whence the Foraminifera figured in the Report of H.M.S. *Challenger* by Brady were derived. *Annals and Magazine of Natural History* (9) **19**: 209–241.

—— 1931. Additional localities of the '*Challenger*' Foraminifera. *Contributions from the Cushman Laboratory for Foraminiferal Research* **7**: 46–47.

Papp, A. & Schmid, M. E. 1985. *Die fossilen Foraminiferen des Tertiaren Beckens von Wien. Revision der Monographie von Alcide d'Orbigny (1846)*. Abhandlungen der Geologischen Bundesanstalt, Wien **35**: 311 pps.

Rehbock, P. F. 1979. The early dredgers: 'naturalising' in British seas, 1830–1850. *Journal of the History of Biology* **12**: 293–368.

Rice, A. L. 1983. Thomas Henry Huxley and the strange case of *Bathybius haeckelii*; a possible alternative explanation. *Archives of Natural History* **2**: 169–180.

—— 1986. *British Oceanographic Vessels 1800–1950*. 193 pps. Ray Society; London.

Rice, A. L., Burstyn, H. L. & Jones, A. G. E. 1976. G. C. Wallich M.D.—megalomaniac or misused oceanographic genius. *Journal of the Society for Bibliography of Natural History* **7**: 423–450.

Rögl, F. & Hansen, H. J. 1984. Foraminifera described by Fichtel & Moll in 1798. A revision of Testacea Microscopica. *Neue Denkschriften des Natur-Historischen Museums in Wien* **3**: 143 pps.

Saidova, Kh. M. 1975. *Benthonic Foraminifera of the Pacific Ocean*. Moscow; Institut Okeanologii P. P. Shishova, Akademiya Nauk S.S.S.R.: 3 vols. (in Russian).

—— 1981. *On an up-to-date system of supraspecific taxonomy of Cenozoic benthonic foraminifera*. 73 pps. Institut Okeanologii P.P. Shishova, Akademiya Nauk S.S.S R. Moscow; (in Russian).

Shchedrina, Z. G. 1964. On some changes in the systematics of the order Rotaliida (Foraminifera). *Voprosy Mikropaleontologii* **8**: 91–101. (in Russian).

—— 1969. On some changes in the systematics of the families Astrorhizidae and Reophacidae (Foraminifera). *Voprosy Mikropaleontologii* **11**: 15 (in Russian).

Srinivasan, M. S. & Sharma, V. 1969. The status of the Late Tertiary foraminifera of Kar [Car] Nicobar described by Schwager in 1866. *Micropaleontology* **15**: 107–110.

—— 1980. *Schwager's Car Nicobar Foraminifera in the Reports of the Novara Expedition – A Revision*. 83 pps. Today & Tomorrow's Printers and Publishers; New Delhi.

Steel, J. W. 1989. *A historical sketch of the Society of Friends 'in scorn called Quakers' in Newcastle and Gateshead, 1653–1898*. 224 pps. G. Robinson & Co. Ltd.; Newcastle-upon-Tyne.

Sverdrup, H. U., Johnson, N. W. & Fleming, R. H. 1942. *The Oceans*. Prentice-Hall, Inc.; Eaglewood Cliffs, New Jersey.

Thalmann, H. E. 1932. Nomenclator (Um—und Neubennungen) zu den Tafeln 1 bis 115 in H. B. Brady's Werk über die Foraminiferen der *Challenger*-Expedition, London 1884. *Eclogae Geologicae Helvetiae* **25**: 293–312.

—— 1933. Beitrag zum Nomenclator zu Brady's Tafelband der Foraminiferen der '*Challenger*'-Expedition. *Eclogae Geologicae Helvetiae* **26**: 251–255.

—— 1937. Mitteilungen über Foraminiferen III. Weitere Nomina mutata in Brady's Werk über die Foraminiferen der '*Challenger*'-Expedition (1884). *Eclogae Geologicae Helvetiae* **30**: 340–342.

—— 1942. Nomina Bradyana mutata. *American Midland Naturalist* **28**: 463–464.

Van Morkhoven, F. P. C. M, Berggren, W. A., Edwards, Anne S., *et al.* 1986. *Cenozoic Cosmopolitan Deep-Water Benthic Foraminifera*. 421 pps. Centres de Recherches Exploration-Production Elf-Aquitaine; Pau, France.

Wallich, G. C. 1862. *The North-Atlantic Sea-Bed: comprising a diary of the voyage on board H.M.S. Bulldog, in 1860; and observations on the presence of animal life, and the formation and nature of organic deposits, at great depths in the Ocean*. 160 pps. John Van Voorst; London.

Wild, J. J. 1877. *Thalassa: an essay on the depth, temperature and currents of the ocean*. 140 pps. Marcus Ward; London.

Woodward, W. B. 1972. Sources of information on the natural history of County Durham. *The Vasculum* **57** (supplement): 1–40.

Wyville Thomson, C. 1873. *The Depths of the Sea*. 527 pps. Macmillan & Co.; London.

—— 1877. *The Voyage of the Challenger. The Atlantic. A preliminary account of the general results of the exploring voyage of H.M.S. Challenger during the year 1873 and the early part of the year 1876*. 2 vols. London.

Yonge, Sir. M. 1972. The inception and significance of the *Challenger* Expedition. *Proceedings of the Second International Congress of the History of Oceanography, Edinburgh, 1972 (Challenger Expedition Centenary Volume)*: 1–14.

Zheng, S. Y. 1979. The Recent foraminifera of the Xishe Islands: Guangdong Province, China, II. *Studia Marina Sinica* **15**: 101–232.

Bull. Br. Mus. Nat. Hist. (hist. Ser.) **18**(2): 145–202 Issued 29 November 1990

The Lady Blake Collection: Catalogue of Lady Edith Blake's Collection of Drawings of Jamaican Lepidoptera and Plants

C. V. ELLWOOD & J. M. V. HARVEY

Department of Library Services, The Natural History Museum, Cromwell Road, London SW7 5BD

CONTENTS

INTRODUCTION

The fascinating collection of watercolours drawn by Lady Edith Blake (1845–1926) between 1889 and 1898 is housed in the Entomology Library of the Natural History Museum, London. The 196 drawings depicting Lepidoptera and plants found in Jamaica, were painted from nature during the time that Lady Blake's husband, Sir Henry, was Governor of the colony.

Edith Blake was a skilled amateur artist, who also had a keen interest in natural history and an ability to observe in detail the objects she drew. Many of the drawings show the various stages in the life cycle of a moth or butterfly and the foodplant of the larval stage. The result of her work in Jamaica is a collection of drawings which have scientific and artistic interest.

The purpose of this paper is to provide a detailed catalogue of these unpublished drawings. As a result of this work it is hoped that the collection and the scientific information it contains will be made available to a wider audience. Each drawing has

been studied by scientists working in the Departments of Entomology and Botany in the Natural History Museum. Their identifications and notes are included in the catalogue together with Lady Blake's own annotations.

Very little has been published on the life of Lady Edith Blake. The biographical information on the lives of the Blakes has been brought together for the first time and reveals an interesting life story. Edith lived in many different parts of the world during the colonial days of the British Empire and as an educated lady exhibited an interest in many different subjects.

Most of Edith Blake's manuscript material remains in Ireland as part of private collections. These include diaries, notebooks, letters and watercolours, mostly landscapes. It is expected that a complete biography will be published by a member of the family in the near future.

A list of works written by Edith and Henry Blake is given. The bibliography includes some references to works not directly referred to in the text. These are listed to aid further reading and are not intended to be comprehensive.

EARLY LIFE

Edith Osborne was born at Newtown Anner, Clonmel, Ireland, in 1845. She was the elder daughter of Ralph Bernal Osborne (1808–1882) and Catherine Isabella Osborne. Edith's sister, Grace Osborne (1848–1926), became Duchess of St. Albans (Ireland) when she married William, Duke of St Albans, on 3 January 1874.

Ralph Bernal had a considerable reputation as an outspoken and witty member of the House of Commons. He was educated at Charterhouse School and entered Trinity College, Cambridge, in 1829. He never settled into his studies; when his father remarried in 1831 he was removed from Cambridge and sent into the army. He spent some time as ensign of the 71st Regiment but soon transferred into the 7th Royal Fusiliers. He was promoted to Captain and remained in the army until entering Parliament in 1841. He spent much of his time enjoying society and developed a reputation as a composer of satirical verses.

His engaging personality helped him to enter the House of Commons as Member of Parliament for Chipping Wycombe. During his career as an MP he held seats at Middlesex (1847–57), Dover (1857–59), Liskeard (1859–65), Nottingham (1866–68) and Waterford (1870–74). He supported the liberal interest and was widely known as one of the most able (if often controversial) debators in the House, especially when speaking on Irish topics. Indeed, when he retired from politics there were many who thought that his loss 'contributed to the decline of the House of Commons and the decline and fall of statesmanship' (Ward, 1885).

On 20 August 1844 he married Catherine Isabella Osborne, the only child of Sir Thomas Osborne of Newtown Anner, County Tipperary, and heiress to considerable estates. On his marriage he assumed the surname Osborne by Royal licence. Catherine was an intelligent woman and her daughters, Edith and Grace, grew up in a stimulating and intellectual environment.

Catherine Osborne died at Newtown Anner on 21 June 1880 and Ralph died at Bestwood Lodge, the seat of the Duke of St Albans, on 4 January 1882.

Although Edith's father was more often in England than in Ireland, there was a constant succession of visitors at Newtown Anner. Edith met men of distinction in art, politics, science, philosophy and literature, and developed an interest in many different subjects. Her particular interests included anthropology, social issues, art and natural

Lady Edith Blake (Courtesy of the National Library of Jamaica)

history. She was also an excellent linguist and learned the language of whichever country she lived in. According to Patricia Cockburn (1985) 'she could speak nine languages: Irish, English, Spanish, French, German, Portuguese, Italian, Russian and Chinese, which later she learned to both read and write'. She corresponded with Joseph Paxton, the landscape designer, who helped design the gardens at Newtown Anner where he is believed to have stayed during a visit to Ireland. She was also a fine horsewoman and well known as a daring rider in the hunting field.

Edith's interest in painting developed early in her life. When she was only 8 years old her sketches already showed promising talent (S. Murray, pers. comm.). Although she was chiefly self-taught, it is likely that she also received some instruction from visitors to the house at Newton Anner. The Osborne family always had an interest in art. Her grandfather, also called Ralph Bernal, was a well-known art collector and many watercolourists stayed at the house. Among them were the Swiss landscape painter Alexandre Calame and Thomas Shotter Boys. Shotter Boys stayed at the house when he exhibited a work painted at Newtown Anner, probably in 1865 or 1866.

A close friend of both sisters was Fanny Currey (*d.* 1912) who stayed with them when she was a girl. She helped Edith and Grace illustrate envelopes for letters sent to their mother. Fanny Currey later exhibited at the Irish Fine Art Society, the Grosvenor Gallery, the Royal Institute of Painters in London and the Royal Hibernian Academy, Dublin (National Gallery of Ireland & Douglas Hyde Gallery, 1987). Grace painted competent watercolours when an adult, but it seems likely that her social position prevented her exhibiting or developing her art. Edith never exhibited her work but continued painting throughout her life.

In February 1872, at the age of 26, Edith began a one-year tour of southern Europe with a clergyman cousin and a maid. She visited Greece, Malta, Sicily, Italy, Austria, Germany and Turkey, everywhere taking an interest in customs, social conditions and

The Monk's and Nun's Islands, Corfu
Illustration from *Twelve months in southern Europe* 1876

architecture. She kept a diary of her travels and observations and published these in *Twelve months in southern Europe* in 1876. It is illustrated with four of her drawings of landscapes and buildings. Considering her later interest in natural history, there is very little observation on the countryside. Her interest at this time focussed on the people and architecture.

Edith was a strong character and had a good sense of humour. Two incidents which she relates in her book are amusing. On one occasion she and her companions walked through the streets of Constantinople wearing dressing-gowns, slippers and travelling hats in search of a bath. On another occasion in Italy they borrowed some fishermen's costumes in order to go swimming.

In 1874 Edith married Henry Arthur Blake (1840–1918). Blake was the son of Peter Blake, County Inspector of Irish Constabulary. Henry Blake's first wife, Jeannie Irwin, died in 1866. Edith and Henry had two sons and a daughter, Olive. The marriage was not approved by Edith's parents. They had been negotiating an arranged marriage (still common in Ireland in the nineteenth century) when Edith eloped with Captain Henry Blake, head of the Clonmel police, Royal Irish Constabulary. This resulted in Edith being disinherited and her name was not mentioned in the house again (Cockburn, 1985). Since Edith had been the heiress to considerable estates and wealth, this was a significant sacrifice. Henry Blake's family was of a lower social standing than her own. His wages from his post in the Royal Irish Constabulary had to support his widowed mother and 12 brothers and sisters.

IRELAND, 1874–1884

After their wedding the Blakes moved to Belfast where Olive, their first child was born. During the early days of their marriage they had little money but Henry was a highly capable man and achieved rapid promotion through the ranks of the police force. His successful career included service as District Inspector at French Park, County Roscommon (Anon., 1918). In 1876 the Blakes' circumstances improved greatly when Henry was appointed Resident Magistrate. It was common in this period for Resident Magistrates to have previously served in the constabulary (McDowell, 1964).

In 1879 Edith Blake published her second book, *The Realities of Freemasonry*. This work is remarkable because it is a woman revealing many of the secrets of a male fraternal society. She attempted to dispel many of the mysteries of Freemasonry and present an unbiased picture of the Fraternity.

The book includes details of the Society's history and explains the ceremonies, secret words and signs used by Freemasons. The text of the work does not reveal the source of her information for this exposé. However, in the introduction she states: 'There are few persons who do not reckon a member of the Fraternity amongst their friends or acquaintances'. Indeed Henry was also a Freemason who achieved high office later in life. It is likely that at least some of her information was obtained from her husband.

During the next few years the Blakes' lives were significantly affected by the social turmoil that was sweeping through Ireland. The agricultural depression of the 1870s had caused a further deterioration in the already desperate conditions of tenant farmers. As a response to the growing discontent the Land League was founded in 1879. Its aim was to protect the tenant farmer and to abolish the landlord system. The League was led by Michael Davitt and Charles Stewart Parnell and they received support from many different levels of Irish Society.

Prime Minister William Gladstone was determined to restore law and order to Ireland.

Sir Henry Arthur Blake (Courtesy of the National Library of Jamaica)

In 1881 he introduced a severe so-called 'Coercion Bill'. Part of this legislation included the suspension of *habeas corpus* and the appointment of five 'Special Magistrates'. Henry Blake was one of these selected Magistrates who could execute wide ranging powers. It was intended that these 'Special Magistrates' should provide firm justice and thereby pacify the growing lawlessness in Ireland.

This duty placed the Blakes in a very dangerous position and Henry was constantly threatened by assassination. A picture of this frightening period and the brave response to danger by Edith Blake is illustrated by the following statement that Henry Blake's life was 'saved on several occasions by his wife's fearlessness. Lady Blake was a fine revolver shot and insisted on accompanying him wherever he went, sitting by him on his jaunting car with her revolver ready cocked in her hand below the rug and similarly armed she sat by him on the bench when he was presiding in court' (Anon., 1927).

During the disturbances Blake distinguished himself with great courage and ability. However, it would not be correct to picture the Blakes as part of an upper class which had no sympathies for Irish nationalist demands. Edith Blake was a highly political woman and held nationalist connections. Indeed one of her close friends was Anna Parnell (1852–1911), sister of Charles Stewart Parnell. Anna founded the radical Ladies Land League which aided the Land League by collecting information on the estates in Ireland. Charles became increasingly concerned about the activities of these ladies and dismantled its organisation. Edith expressed 'dislike and contempt for Charles Stewart Parnell' and retained 'affectionate nostalgia for Anna' (Cockburn, 1985).

After serving as a 'Special Magistrate' Henry Blake applied for a colonial post in the British Empire. He had shown himself to be an extremely capable man and in 1884 he was offered the Governorship of the Bahamas. This represented a spectacular rise in his social position in a relatively short time.

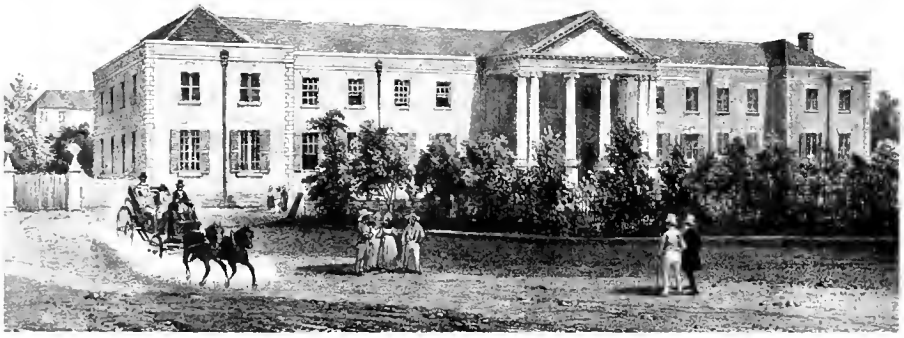
COLONIAL LIFE

Henry Blake's appointment as Governor of the Bahamas was the first of a series of governorships which were to take the couple to many areas of the British Empire. He was Governor of the Bahamas, 1884–1887, Newfoundland, 1887–1888, Jamaica, 1889–1897, Hong Kong, 1897–1903, and Ceylon, 1903–1907. Everywhere the Blakes went they took a deep interest in the development and conditions of the country. Henry took an active role in developing the countries' economies and Edith concerned herself with social welfare, often intervening in situations where she saw injustice or oppression. Their obvious interest in the conditions of the people made them well regarded and elicited support for many of their ideas. Edith also continued to show interest in local customs and natural history. She collected native artefacts, including pottery and stone implements, and painted the flora, fauna and landscape.

Little is known about the Blakes' time in the Bahamas. As it was Henry's first appointment as Governor it is likely that he spent much of his time becoming familiar with his duties and acquainting himself with the state of the country and its people. His interest in the Colony and its progress is indicated in the following extract from a letter from Blake to Sir Joseph Hooker (1817–1911) who was at that time Director of the Royal Botanic Gardens, Kew (12 May 1881):

> I want to get a man for a couple of years who knows something of botany and chemistry & is capable of making analysis of soils. There is an inspector of agriculture here who knows nothing whom I desire to replace . . . It strikes me that with the field

> for observation so extended and [unworked] as it is here, a young man might be willing to take the post who has gone through a course of study at home . . . If he were an ornithologist he could prepare specimens & make money of them as the birds are practically unknown . . . Will you kindly let me know if in your opinion such a man as I want is to be had on these terms.
> (Kew: Leeward Islands Letters 1864–1900; 212(579)).



King's House, Spanish Town, Jamaica, *c.* 1880s (Courtesy of the National Library of Jamaica)

As always Edith would have supported him, in addition to pursuing her particular interests in natural history and anthropology. Native Indian artefacts which she collected in the Bahamas are to be found at the Museum of the American Indian in New York (see p. 158).

In 1887 Henry was posted to Newfoundland where he remained for only a year. During this short time he made a favourable impression. His travels around the country to meet people and assess the needs of the colony earned him the reputation 'of being an able and vigorous administrator, one solicitous to know the true state of the country and its resources and the real condition of its inhabitants' (Anon., 1888*b*).

Henry and Edith were also active in setting up the Newfoundland Society for the Prevention of Cruelty to Animals. They held a bazaar in Government House to raise funds and accepted the offer of the Committee to become Patron and Patroness of the Society when it was inaugurated in November 1888 (Anon., 1888*d*).

Edith wrote a series of articles in the *Evening Telegram* on the 'Beothuks of Newfoundland' between 26 December 1888 and 17 January 1889. In these articles she traces the history of the discovery of Newfoundland and the effect this had on the native populations. Her concern for local people shows when she says 'no Spanish freebooter or Yankee could show more utter disregard for the life of an Indian than did Britishers in

Newfoundland' (*Evening Telegram* 5 January 1889). The series also reveals her interest in natural history as she describes the Newfoundland countryside, identifying mosses and lichens as well as the more obvious flowers and trees.

In October 1888 Henry was appointed as Governor of Queensland. However, he resigned without taking up his appointment owing to opposition from a section of the Irish residents of the Colony who resented his previous activities as 'Special Magistrate'.

Instead he was made Captain General and Governor-in-Chief of Jamaica, taking up the appointment on 9 March 1889. The couple again made a good impression following their arrival and spent nine years in Jamaica, the term of office being extended twice at the request of the legislature and public bodies.

While in Jamaica Henry Blake worked hard to make the country better known throughout the world. He believed strongly in the future economic success of Jamaica and put energy and money into improving the island's resources. Soon after their arrival Blake wrote to Daniel Morris (1844–1933), Assistant Director at Kew (9 April 1889): 'We like Jamaica immensely. It is very lovely and I think is on the eve of considerable progress' (Kew: Jamaica Letters 1865–1900; 210(10)). Morris had previously been Director of the Public Gardens of Jamaica (1879–1886).

Blake encouraged industry and development. Due to his enthusiasm, many roads and bridges were built, the railway was extended to all parts of the island, an underground system of drainage for Kingston was constructed and many new hotels were built throughout the island.

Henry and Edith obviously loved Jamaica and actively advertised the 'extraordinary beauty and delight of the Island as a health resort' (Morris, 1891). Morris also says that 'the development of the tourist trade ... was due in great measure to the efforts of himself [Henry] and Lady Blake' (Morris, 1891).

One of Blake's most important initiatives was the organization of the International Exhibition of 1891, opened by George, Prince of Wales on 27 January and remaining open until 2 May. The exhibition displayed the natural and manufactured products of the island and led to improved trade and tourism (Morris, 1891; Anon., 1897).

Henry was also aware of the importance of agriculture to the Jamaican economy. He took advantage of trips to England to discuss policy with Sir William Thistleton Dyer (1843–1928), Director at Kew, as this extract from a letter from Blake to Lord Ripon shows (23 October 1894):

> I had a long conversation today [with] Mr. [Thistleton] Dyer and Mr. Wangfield and I find there is no divergence in our views as to the course to be pursued in the matter of the Botanic Department and the question of Agricultural development financially. (BL: Lord Ripon's Papers Vol. LXXIV, Add. Mss 43564).

Blake also founded the Jamaica Agricultural Society in 1895, and became its first President. Edith supported the construction of a marine laboratory to encourage visiting scientists to study the rich flora and fauna of the island (Anon., 1892*a*).

It is in Jamaica that Edith's interest in botany, entomology and painting becomes evident. The first major flora of Jamaica, W. Fawcett & A. B. Rendle's *Flora of Jamaica* (1910), lists both Henry and Edith as significant collectors and the authors acknowledge Blake's support, when they '... thank the Government of Jamaica for the loan of the whole of the material contained in the Jamaican Herbarium'.

The spectacular Jamaican flora and fauna inspired Edith to spend more time at her painting. The results can be seen in this collection of drawings of plants and Lepidoptera which Clark (1898) describes: 'Lady Blake has painted from life, the caterpillars, chrysalids and adults of many of the native Lepidoptera, and her collection of over 100 watercolours of this order are a treat to the artist as well as to the entomologist'. Edith

also painted landscapes and many of the beautifully coloured fish found in the Caribbean Sea (now in private collections). She was evidently well known for her interest in art: 'Lady Blake did much to encourage the taste for art, she herself making many entomological drawings and some landscapes' (Sherlock, 1940).

During this time Edith corresponded with Daniel Morris at Kew and sent him several consignments of seeds as this letter from Edith to Morris shows (29 September 1895):

> I was fortunate enough the other day to [procure] some of the seeds & two roots of that magnificent white lotus which I believe was supposed to have disappeared from this island. The flowers are beautiful, as large if not larger than those of the Victoria Regia . . . I send you three of the seeds in case you have not already got them . . .
> (Kew: Jamaica Letters 1865–1900; 210(8)).

(The letter is annotated '?Nelumbium luteum 3 seeds, quite dead WW').

Henry and Edith lived in King's House, the official residence of the Governor, throughout their stay in Jamaica. They planted the garden with many ornamental palms, orchids, ferns and other plants and maintained attractive borders. The garden was considered one of the most attractive ornamental gardens in Jamaica (Morris, 1891).

Edith's interest in anthropology continued and there are specimens from Jamaica in the Museum of the American Indian (see p. 158).

When Henry was appointed Governor of Hong Kong in 1898 their loss to Jamaica was regretted: 'For the past nine years natural science in Jamaica has enjoyed the patronage and support in countless ways of his Excellency Sir Henry Blake, the Governor of the island and his estimable wife . . .' (Clarke, 1898). Henry and Edith arrived in Hong Kong at a difficult time politically and it seems likely there was little opportunity for Edith to continue with her own interests. Certainly there is little information on her during this period. Henry continued to show enthusiasm and dedication to his work and Edith no doubt continued to support him.

Blake's major task was to take over the New Territory leased by China to Great Britain in June 1898. The many arguments over concessions to China produced an atmosphere of crisis and uncertainty and the Boxer Rebellion of 1900 added to the tension. Blake supported the retention of Chinese law and customs and hoped that the New Territory could be administered through existing Chinese headmen. Although this did not work in practice his support for the Chinese cause won him many friends.

Plague became endemic during this period, adding to Blake's problems. He was one of the first to accept that the plague was carried by rats. He initiated a scheme to pay 2 cents per rat killed, which had to be abandoned when it was discovered that the Chinese imported rats from the mainland to collect the reward! He continued with extensive disinfestation and disinfection programmes which failed to make much impact. There was much disagreement as to the source of the infection and even the Medical Officer of Health was of the opinion that 'it was more probable that rats caught plague from men than that men were infected through rats' (Endacott, 1965).

Blake corresponded with Thistleton Dyer about his experiments on treating the plague. This letter written by Blake from Ceylon indicates his interest (2 February 1904):

> . . . I entered upon the experiment because I wanted in the first place to try to enlist the people which in China can always be accomplished by those who treat them properly & who have acquired their confidence . . . as it turned out my plan so far succeeded that the professional men have endeavoured to follow the same lines . . .
> (Kew: Ceylon, Aiden & Persian Letters 1901–1914; 164(171)).

In 1898, Sir Ronald Ross (1857–1932) discovered that malaria was carried and transmitted by the mosquito and Henry again acted promptly. He employed Professor W. Simpson of the London School of Tropical Medicine to deal with the control of mosquitoes in Hong Kong.

Henry and Edith continued to show interest in botany. Two species of oak, native in the New Territories of Hong Kong, are separately named after the couple. *Quercus blakei* 'is named after the distinguished Governor of Hong Kong, Sir Henry Blake, G.C.M.G., from whom botanical investigations in the colony have received constant support and encouragement' and *Q. edithae* is named after Edith Blake (Skan, 1901). The floral emblem of Hong Kong, the rare Hong Kong orchid tree *Bauhinia blakeana*, is also named in tribute to the Blakes. It commemorates their 'kindly interest taken in the Hongkong Botanic Gardens' (Dunn, 1908).

When Henry was appointed Governor of Ceylon in 1903, petitions were sent from Hong Kong to London urging for an extension of his term of office, but were unsuccessful. He had again proved a popular Governor: '. . . he not only managed to win the support of the vast majority of the population, and most importantly the business community and the Legislative Council, but managed to translate this support into effective action for the betterment of Hong Kong' (Routledge, 1980).

Before their departure in November 1903 the Blakes were honoured by a ceremony marking the Colony's appreciation, especially in regard to the efforts made to improve the treatment of victims of the plague. They were presented with an embroidered canopy and a speech was made thanking Blake for his sympathy and support of the poorer citizens.

The country greatly interested Blake and he later published a book on the country's history and customs entitled *China* (1909). He included anecdotes from this time as Governor and an extract from an address given by Edith on the position of women in China.

Evidence of the Blake's interest in botany while in Ceylon appears in letters at Kew. Soon after his arrival Henry wrote to Thistleton Dyer (2 February 1904):

> . . . I think we have an excellent staff here at Peradeniya, but to my mind the horticultural [sic] is not sufficiently looked into. Man cannot live by bread alone and I want to see more prominent floral attraction where so many people visit. It need not interfere with the solid work of the department but even here there might be interesting & valuable experiments in hybridisation. I wish you would give a hint to Mr. Willis . . .
> (Kew: Ceylon, Aiden & Persian Letters 1901–1914; 164(171)).

The 'Mr. Willis' referred to is John Christopher Willis (1868–1958), Director of the Botanic Garden at Peradeniya, 1896–1911.

In 1904 Blake started an Agricultural Society on the same lines as that in Jamaica which was 'faring splendidly' in September 1905 when he wrote to Thistleton Dyer (Kew: West Indies Letters 1893–1916; 164(179)).

Edith continued to send plants to Kew and also to William Fawcett (1851–1926) who was collecting plants in Jamaica (17 April 1905): 'The mango & banana plants that you wanted have been despatched to you from Peradeniya via Kew'. She also offered advice on keeping silk worms: 'If the silk worms were kept in sheds that had net over the doors & windows to [keep] out flies, they ought to do well in Jamaica. I had some of a kind that eat castor oil plants at Kandy' (Kew: West Indies Letters 1893–1916; 208(379)). When she and Henry visited London in September 1905 she brought insects and plants with her.

Henry retired as Governor of Ceylon and from the colonial service in 1907 at the age of 67 years. He had a long and successful career which earned him respect and popularity which Edith had also shared.

AFTER RETIREMENT

The following year the Blakes returned to their beloved Jamaica on a triumphant visit. They arrived on Christmas day and received a great welcome which included official addresses and a public banquet (Anon., 1918).

On their return to Ireland, they settled into Myrtle Grove, a Tudor House in Youghal, County Cork. They carried out extensive repairs and alterations to the house which had once been the residence of Sir Walter Raleigh.

During his retirement Henry Blake resumed his interest in Irish reform work. He contributed many articles on Irish topics to reviews such as the *Nineteenth Century*. Due to his wide experience in colonial affairs he was consulted about the system of Crown Colony Government for Ireland. He accepted a seat as a Southern Unionist in the Irish Convention which was established in 1917 in response to demands for Home Rule.

Henry Blake died on 23 February 1918. The *Journal of the Cork Historical and Archaeological Society* published an obituary which described him as 'A man of a broad and well-cultured mind an interesting and delightful lecturer' (Lee, 1918).

On hearing of Sir Henry's death the Legislative Council in Jamaica passed a resolution of condolence to Edith and stated that his 'administration of the affairs of Jamaica for many years improved this colony considerably to the best interest of the people' (Anon., 1918).

The death of Henry Blake was a tragic loss for Edith and subsequently she would rarely leave the house except to sit in the garden (Cockburn, 1985). She suffered from rheumatism and wore only mourning black. Her great desire to be once more in contact with her husband lead her to seek the services of a medium, Miss Barlow. She was one of only a few visitors to the house during this sad time. Edith died at Myrtle Grove on 18 April 1926.

THE COLLECTION

The Lady Blake Collection consists of 196 drawings of Jamaican Lepidoptera and plants. Most of the drawings are finished watercolours depicting the life cycle of Lepidoptera. The butterfly or moth is frequently illustrated with a plant which in many examples is the foodplant of the larva. Larval damage to the plant is also shown.

Most of the Lepidoptera drawings are accurate and illustrate the different stages in the life cycle. The egg stage is never illustrated. The larval stage and, in some examples, the different larval instars are depicted. Larvae are often shown in their characteristic feeding position. The damage caused to the plants by the larvae is clearly and accurately recorded. This aspect of the collection is of special interest and value as it provides details of the larval foodplants. Heineman (Brown & Heineman, 1972) wrote in his work on Jamaican butterflies: 'There is a crying need for lepidopterists to work on the life histories of butterflies. In many instances we do not know the food plant of the larvae.'

The pupae are accurately drawn either attached to the plant or separately when the larva pupates away from its foodplant. Most adults are shown in flight but occasionally are depicted at rest. For some drawings it has not been possible to determine whether the adult is male or female.

A few Hymenoptera and Diptera are also illustrated. For example Drawing no. 66 illustrates Tachinid adults and puparia. Drawing no. 53 includes the only non-insect animal species, a lizard (*Anolis* sp.) which is commonly found in Jamaica.

The plant illustrations vary in their quality and detail and clearly have not received the same level of attention as the Lepidoptera. Over one-third of the drawings have been accurately identified. Many of the more common plants found in Jamaica are illustrated including introduced species.

The drawings consist of watercolour on paper. To provide greater body to some of the illustrations, varnish and gouache have also been used. Most of the drawings are completed although a few are unfinished studies of plants or Lepidoptera. Drawings vary from delicate works with well-balanced composition to bold and dramatic images. Edith's technique was obviously that of an amateur; although quite detailed, many of the plant illustrations appear rather flat on the page.

A wide range of papers have been used throughout the collection including some dyed blue. This suggests that Edith did not have access to a large stock of standard paper and used anything suitable as it became available.

The drawings were not simply the result of artistic interest. Edith spent time collecting and rearing Lepidoptera and made observations about their life cycle. She also kept a natural history notebook, which is referred to in Drawing no. 74, moreover many of the drawings have been annotated by her. The annotations include tentative identifications of Lepidoptera and notes and observations on the dates of pupation and adult emergence. These notes show that she took pupae with her during voyages from Jamaica. For example Drawing no. 170 includes a note that she took a pupa home to England in 1894; the adult emerged in London.

HISTORY OF THE COLLECTION

On Edith Blake's death in 1926 her daughter, Olive Arbuthnot, presented the collection to the British Museum (Natural History). This occurred on the recommendation of Lord Lionel Walter Rothschild (1868–1937) and Dr Charles Gahan (1862–1939), Keeper of the Department of Entomology.

The drawings were sorted and stamped numerically in the centre of each sheet. It was recognised that they provided valuable information about the Lepidoptera and flora of Jamaica. Norman D. Riley (1890–1979), Keeper of Entomology at the Museum, made a preliminary study of the collection and his pencil notes of possible identifications appear on the drawings.

During 1984, as part of a programme of conservation in the Department of Library Services, the drawings were treated by a specialist paper conservator. Each drawing was cleaned and mounted in acid-free paper folders and protected by a sheet of Melinex.

In 1987 two drawings, nos. 13 and 17, were loaned to the National Gallery of Ireland and were included in an exhibition, 'Irish Women Artists from the Eighteenth Century to the Present Day' (National Gallery of Ireland & Douglas Hyde Gallery, 1987). This supported the recognition of Lady Blake as a notable amateur Irish artist.

PUBLICATIONS

Sir Henry Arthur Blake

1880. *Pictures from Ireland* (as Terence M'Grath). 206pp. London.
1881. —— 2nd ed. 206pp. London.
1881. —— 3rd ed. 206pp. London.
1896. *Jamaica: photographs of the principal bridges erected in the island from 1890 to 1895*. Kingston. (Held in the West India Library of the Institute of Jamaica; not seen.)
1907. *Progress of the colony of Ceylon, 1904–1907*. 57pp. Colombo.
1909. *China* (illustrations by M. Menpes). vii, 138pp. London.

Lady Edith Blake

1876. *Twelve months in southern Europe*. 341pp. 4 pls. London.
1879. *The realities of Freemasonry*. 264pp. London.
1888–1889. Beothuks of Newfoundland. *Evening Telegram* 26 December 1888–17 January 1889.
1888. The Beothuks of Newfoundland. *Nineteenth Century* **24**: 899–918.
1888. In the Bahamas. *Nineteenth Century* **23**: 682–692.
1891. A chat about Newfoundland. *North American Review* **152**: 714–722.
1892. Highlands of Jamaica. *North American Review* **154**: 343–352.
1912. The Triad Society and the restoration of the Ming Dynasty. *Nineteenth Century* **71**: 667–687.
1912. The position of women in China. *Nineteenth Century* **72**: 1040–1051.
1913. Santa Sophia and its memories. *Nineteenth Century* **73**: 355–376.
1913. 'Tir-na-Bes', a study of Irish life – and death. *Nineteenth Century* **74**: 130–135.
1914. The sacred Bo Tree. *Nineteenth Century* **76**: 660–673.

LOCATION OF COLLECTIONS

Most of Edith Blake's manuscripts and drawings are in private collections. Papers relating to Henry Blake's colonial service are to be found at the Public Record Office, Kew. The sources located during research for this paper are listed below.

1. NATURAL HISTORY MUSEUM, Entomology Library, Cromwell Road, London SW7 5BD.
   196 watercolour drawings of Jamaican plants and Lepidoptera, 1889–1898.
   (Entomology Library drawings collection.)

2. ROYAL BOTANIC GARDENS, KEW, Richmond, Surrey TW9 3AB. (Kew)
   17 letters from Edith and Henry Blake to Directors of Kew, 1884–1905.
   (Archives: Director's correspondence).

3. BRITISH LIBRARY, Department of Manuscripts, Great Russell Street, London WC1B 3DG. (BL)
   Letters from Henry Blake to Lord Ripon, 1892–1894.
   (Additional Manuscripts 43564: Lord Ripon Papers, volume **74**).

4. PROVINCIAL ARCHIVES OF NEWFOUNDLAND AND LABRADOR, Colonial Building, Military Road, St. John's, Newfoundland A1C 2C9.
   Letter of appointment as Governor (29 June 1887) and Invitation to become Patrons of the Society for the Prevention of Cruelty to Animals plus Prospectus (29 October 1887).
   (GN 1/3A series).

5. MUSEUM OF THE AMERICAN INDIAN, Heye Foundation, Broadway at 155th Street, New York, New York 10032 USA.

29 pages of correspondence from Edith and Henry Blake (1916–1917). Catalogue notes relating to the purchase of archaeological collections from the Caicos Islands, Jamaica, the Bahamas, etc. (some of the notes dated 1896).
(Archives Box OC123, Folder 25).

6. AMERICAN MUSEUM OF NATURAL HISTORY, Anthropology Department, Central Park West at 79th Street, New York, New York 10024 USA.
Fossil shell cast, marine and land shells and beetles from Jamaica, accessioned in 1896.
(Accession numbers: 2450 & 2477).

BIBLIOGRAPHY

Anon. 1844. *Gentleman's Magazine* Pt. **ii**: 310, 538.
—— 1882*a*. *Times* 5 January.
—— 1882*b*. *Times* 11 January.
—— 1884*a*. *Temple Bar* September.
—— 1884*b*. *Fortnightly Review* October.
—— 1887. Our new Governor. *Evening Telegram* 8 September.
—— 1888*a*. Promotion of Governor Blake. *Evening Telegram* 25 October.
—— 1888*b*. Society for the Prevention of Cruelty to Animals. *Evening Telegram* 12 November.
—— 1888*c*. Farewell to Sir Henry. *Evening Telegram* 14 November.
—— 1888*d*. About Governor Blake. *Evening Telegram* 8 December.
—— 1889. Governor Blake's son. *Evening Telegram* 17 January.
—— 1892*a*. A marine laboratory for Jamaica. *Journal of the Institute of Jamaica* **1**(3): 89.
—— 1892*b*. Notes and queries. *Journal of the Institute of Jamaica* **1**(3): 184.
—— 1897. Resumé of the work & transactions of the Society. *Journal of the Jamaica Agricultural Society* **1**(1): 2–3.
—— 1913. Gossip. *Irish Book Lover* **5**: 63–64.
—— 1918. *Irish Times* 25 February.
Bagenal, P. H. D. 1884. *Life of Ralph Bernal Osborne, M.P.* x, 371pp. London.
Brown, F. M. & Heineman, B. 1972. *Jamaica and its butterflies*. 478pp. **10**[1] pls. London.
Clark, H. L. 1898. Zoological Jamaica. *Natural Science* (September): 161–171.
Cn, J. 1918. Sir Henry Blake G.C.M.G. *Irish Book Lover* **9**: 110–111.
Cockburn, P. 1985. *Figure of eight*. 243pp. 8 pls. London.
Crone, J. S. 1928. *A concise dictionary of Irish biography*. viii, 270pp. Dublin.
Cundall, F. 1915. *Historic Jamaica*. xxiii, 424pp. London.
Currey, F. W. 1877. *Prime Ritto; or the four-leaved shamrock*. 39pp. London.
Desmond, R. 1977. *Dictionary of British and Irish botanists and horticulturists*. xxvi, 747pp. London.
Dunn, S. T. 1908. New Chinese plants. *Journal of Botany* **46**: 325–326.
Endacott, G. B. 1965. They lived in Government House. *China Mail* 19 June.
—— 1973. *A history of Hong Kong*. Rev. edn. xii, 324pp. (Oxford in Asia paperbacks). Hong Kong.
Fawcett, W. & Rendle, A. B. 1910. *Flora of Jamaica*. Vol. 1: 150pp. 32 pls. London.
Hickey, D. J. & Doherty, J. E. 1987. *A dictionary of Irish history 1800–1980*. 615pp. Dublin.
Jarrett, V. H. G. 1933–1935. Old Hong Kong. *South China Morning Post*. 17 June 1933–13 April 1935.
Kee, R. *c*. 1980. *Ireland: a history*. 256pp. 16 pls. London.
Lee, P. G. 1918. The late Sir Henry Arthur Blake, G.C.M.G. *Journal of the Cork Historical and Archaeological Society* **24**: 45.
McDowell, R. B. 1964. *Irish administration 1801–1914*. xi, 328pp. (Studies in Irish history, 2nd series; vol. **2**). London.
Morris, D. 1891. Report of a botanical mission to the West Indies ... [Jamaica]. *Kew Bulletin* **1891**: 154–158.

National Gallery of Ireland & Douglas Hyde Gallery 1987. *Irish women artists: from the eighteenth century to the present day*. xxxxviii, 208pp. Dublin.
Parsons, A. A. 1920. Governors I have known. *Newfoundland Quarterly* **20**(3): 1–3.
Prowse, D. W. 1895. *A history of Newfoundland from the English, Colonial and foreign records*. xxiii, 742pp. London.
Riley, N. D. 1975. *A field guide to the butterflies of the West Indies*. 224pp. London.
Routledge, T. 1980. Governors of Hong Kong 13: Sir Henry Arthur Blake. *Hong Kong Tatler* **4**(41): 28–31.
Sayer, G. R. 1975. *Hong Kong 1862–1919*. xiv, 166pp. 13 pls. Hong Kong.
Sherlock, P. M. (Ed.) 1940. *Jamaica to-day*. 240pp. [London].
Skan, S. A. 1901. *Quercus Edithae* Skan. *Hooker's Icones Plantarum* 4th series **7**: pl. 2661.
—— 1901. *Quercus blakei*, Skan. *Hooker's Icones Plantarum* 4th series **7**: pl. 2662.
Smallwood, J. R. & Pitt, R. D. W. (Eds) 1981–. *Encyclopedia of Newfoundland and Labrador*. Vol. 1– St. John's, Newfoundland.
Stenton, M. (Ed.) 1976. *Who's who of British Members of Parliament, volume 1: 1832–1875*. xvi, 448pp. Hassocks.
Stephen, L. (Ed.) 1885. *The dictionary of national biography*. Vol. **2**: 1395pp. London.
Ward, T. H. (Ed.) 1885. *Men of the reign*. iv, 1020pp. London.
Who was who, 1916–1928. xv, 1159pp. London.

EXPLANATION OF CATALOGUE ENTRY

SAMPLE ENTRY

134. MOTH: Fam. Sphingidae: Macroglossinae Probably *Pseudosphinx tetrio* L. (Frangipani Sphinx)
1 larva on stem, 1 larva on leaf; 1 pupa drawn separately; 1 adult in flight
PLANT: Fam. Apocynaceae *Plumeria rubra* L. (Frangipani) Stem, leaves and flowers. Shows larval damage.
ANNOTATIONS: *r* [ink] 'Chrysalis formed 15th June. Moth emerged 8th July. 1893.'; 'King's House 8th June. 1893'
SIZE: 331 × 456 mm
NOTES: Food plants of *P. tetrio* recorded in literature as *P. rubra* and *Jasminum* sp. (Oleaceae).

CATALOGUE NUMBER

The catalogue number refers to the running number stamped on the drawing.

BUTTERFLY/MOTH

The currently accepted scientific name of the butterfly or moth is given as identified by the staff of the Natural History Museum Entomology Department. The Family name is given and where possible the Genus and Species. It has not always been possible to give a full identification. Where there is doubt the terms 'probably' and 'possibly' have been used. The common name is given where one is known to exist.

The numbers of larvae, pupae and adults figured are given. Adult males and females are distinguished where possible.

Where there is more than one species, the numbers in square brackets before the family name refer either to Edith Blake's own numbers on the drawing or to a given number on the verso of the drawing.

PLANT

The modern botanical name for the plant is given. The Family name is given and where possible the Genus and Species name. Where a full identification cannot be made it is usually because only

a leaf is figured or the drawing is unfinished. The common name is also given where one is known. Plant names are based on C. D. Adams *Flowering plants of Jamaica*, 1972. Where a name has been changed since this publication, the new name is given in brackets.

A short description of the image indicates the presence of stems, leaves, flowers, fruit and larval or other damage.

ANNOTATIONS

Annotations in Edith Blake's hand are recorded. Annotations in other hands are not given.

Annotations on the recto of the drawing are preceded by *r* and those on the verso by *v*. The medium of the annotations (i.e. pencil or ink) is noted in square brackets. All annotations are included between inverted commas.

The annotations generally include date of pupation, date of emergence of adult and occasionally localities.

In some instances part of the annotation has been partially deleted by Edith Blake and these have been transcribed and enclosed in double square brackets, e.g. [[ ]].

SIZE

The size of the drawing is recorded in millimetres as follows: height × width. These are the dimensions of the paper support.

NOTES

The notes area contains information on identification and/or food plants where these are considered useful. It also gives details of previous reproductions of the image.

INDEXES

1. Index of lepidoptera names – alphabetical, including family names, modern species names and common names with reference to the catalogue entry number.
2. Index of plant names – alphabetical, including family names, modern species names and common names with reference to the catalogue entry number.

ACKNOWLEDGEMENTS

The authors would like to express their thanks for the specialist help given by colleagues in the Department of Entomology, The Natural History Museum, London, especially Dr Gaden Robinson, Mr Phil Ackery, Mr David Carter, Dr Malcolm Scoble, Dr Ian Kitching, Mr Michael Schaffer, Mr Kevin Tuck, Mr Martin Honey, Mr David Goodger and Mr Gerry Tremewan. We would also like to thank Dr Dennis Adams, Research Associate in the Department of Botany. We are also grateful for the generous help afforded by: Nancy Rosoff, Museum of the American Indian. Pat O'Sullivan, National Museum of Ireland; Valerie Seymour, St. Patrick's College Library, Co. Kildare; Paula Howard, Dublin Public Libraries; D. O. Luanaigh, National Library of Ireland; Eppie D. Dwars, National Library of Jamaica; staff of the Royal Botanic Gardens, Kew; Nora de Brun, The Boole Library, University College, Cork; Sharon S. L. Law, Hong Kong Museum of Art; C. C. Wong, Reference Librarian, Chinese University of Hong Kong; Sarah C. Choy, Public Records Office of Hong Kong; Derek Bussey, Newfoundland Public Library Service and Howard C. Brown, Provincial Archives of Newfoundland and Labrador.

We acknowledge the assistance given by the family and in particular Mrs Shirley Murray and the late Mrs Patricia Cockburn.

This project has been supported and encouraged by our library colleagues in particular by Mr Rex Banks, Miss Pamela Gilbert, Mrs Kathy Martin, Mr Malcolm Beasley and Mr Nick Stead.

THE CATALOGUE

1. BUTTERFLY: [1] Fam. Papilionidae *Battus polydamus jamaicensis* Rothschild & Jordan (Jamaican Polydamus)
1 larva on leaf, 1 larva on stem; 1 pupa on stem, 1 pupa drawn separately; 1 adult in flight.
BUTTERFLY: [2] Fam. Papilionidae Possibly *Battus polydamus jamaicensis* Rothschild & Jordan (Jamaican Polydamus)
1 larva on stem.
PLANT: Fam. Aristolochiaceae *Aristolochia trilobata* L. (Tref)
Twining stem with leaves and flowers. Shows larval damage. Also separate stem with pupa attached.
ANNOTATIONS: *r* [ink] 'Caterpillar no. 2 having devoured one of the butter-fly chrysalidae, buried itself 25th July.'; 'Chrysalis formed 10th June. Butterfly emerged 26th July. 1893.'
SIZE: 456 × 330 mm
NOTES: Foodplant of *B. polydamus jamaicensis* recorded in literature as *A. trilobata*.

2. BUTTERFLY: Fam. Papilionidae *Papilio thersites* Fabricius (Thersites Swallowtail)
1 larva on stem; 1 pupa on stem; 1 adult female in flight.
PLANT: Fam. Rutaceae *Fagara pterota* L. (= *Zanthoxylum fagara* (L.) Sarg.) (Bastard Ironwood, Saven Tree)
Stem and leaves. No larval damage.
ANNOTATIONS: *r* [ink] 'Chrysalis formed 21st Sept. Butterfly emerged 20th Oct 97'
SIZE: 306 × 243 mm
NOTES: Foodplant of *P. thersites* recorded in literature as citrus plants (Rutaceae).

3. BUTTERFLY: Fam. Papilionidae *Papilio thoas melonius* Rothschild & Jordan (Jamaican Swallowtail)
2 larvae on stem; 1 pupa on stem; 1 adult in flight.
PLANT: Fam. Rutaceae *Fagara pterota* L. (= *Zanthoxylum fagara* (L.) Sarg.) (Bastard Ironweed, Saven Tree)
Stem, leaves and flowers in very young bud. No larval damage.
ANNOTATIONS: *r* [ink] 'Chrysalis formed 7th June. Butterfly emerged 28th June 1893.'; *v* [pencil] 'Chrysalis formed 7th June. Butterfly emerged 28th June.'
SIZE: 300 × 235 mm
NOTES: Foodplant of *P. thoas melonius* recorded in literature as *Piper* sp. (Piperaceae).

4. BUTTERFLY: Fam. Papilionidae *Papilio homerus* Fabricius (Homerus Swallowtail)
1 larva on stem; 1 pupa on stem; 1 adult in flight.
PLANT: Fam. Hernandiaceae *Hernandia catalpifolia* Britton & Harris (Water Mahoe, Water Wood)
Stem and leaves. No larval damage.
ANNOTATIONS: *r* [ink] 'Caterpillar attached itself to branch 29th Nov. Chrysalis formed 2d Dec. Butterfly emerged 29th Dec 1893.'; *v* [pencil] 'Caterpillar fixed itself 29th Nov Chrysalis formed 2nd Dec.'
SIZE: 456 × 330 mm
NOTES: Foodplant of *P. homerus* recorded in literature as *Ipomoea* sp. (Convolvulaceae) and possibly *Chimarrhis* sp. (Rubiaceae) *Thespesia* sp. (Malvaceae) and *Hernandia* sp. (Hernandiaceae).

5. BUTTERFLY: Fam. Pieridae *Appias drusilla jacksoni* Kaye *(Jamaican Albatross)*
1 larva on leaf; 1 pupa on leaf; 1 adult male in flight.
PLANT: Unidentified
Stem and leaves. Shows larval damage.
ANNOTATIONS: r [ink] 'Chrysalis formed 15th Sept. Butterfly emerged 23d. Sept. 1893.'
SIZE: 306 × 243 mm
NOTES: Foodplants of *A. drusilla jacksoni* recorded in literature as *Capparis* sp. (Capparaceae) and *Drypetes* sp. (Euphorbiaceae).

6. BUTTERFLY: Fam. Pieridae *Ascia monuste eubotea* Godart (Antillean Great White)
1 larva on stem, 2 larvae on leaves; 1 pupa on stem; 1 adult male in flight, 1 adult female in flight.
PLANT: Fam. Capparaceae *Cleome spinosa* Jacq.
Stem and leaves. No larval damage.
ANNOTATIONS: *r* [ink] 'Chrysalis formed 3d August. Butterfly emerged 13th August. 93.'
SIZE: 300 × 235 mm
NOTES: Foodplants of *A. monuste eubotea* recorded in literature as *Crataeva* sp., *Cleome* sp. (Capparaceae), *Brassica* sp., *Lepidium* sp. (Cruciferae (Brassicaceae)) and *Tropaeoleum* sp. (Tropaeolaceae).

7. BUTTERFLY: Fam. Pieridae *Eurema daira palmira* Poey (Poey's Barred Sulphur)
1 larva on stem; 1 pupa on stem; 1 adult male in flight.
PLANT: Unidentified
Stem and leaves. Shows larval damage.
ANNOTATIONS: *r* [ink] 'Chrysalis formed 6th Sept. Butterfly emerged 12th Sept. 95.'
SIZE: 351 × 249 mm
NOTES: Foodplants of *E. daira palmira* recorded in literature as Papilionaceae (*Aeschynomene* sp., *Stylosanthes* sp., *Desmodium* sp.) and Caesalpinaceae (*Cassia* sp.)

8. BUTTERFLY: Fam. Pieridae *Eurema elathea* Cramer (Cramer's Barred Sulphur)
1 larva on stem; 1 pupa on stem; 1 adult male in flight.
PLANT: Fam. Papilionaceae (Fabaceae) *Stylosanthes hamata* (L.) Taub. (Cheesy Toes, Donkey Weed, Pencil Flower)
Stem, leaves and flowers. No larval damage.
ANNOTATIONS: *r* [ink] 'Chrysalis formed 16th Feb. Butterfly emerged 27th Feb. 94 Terias elathea = Cramer.'; *v* [pencil] 'Chrysalis 16th Feb'
SIZE: 238 × 300 mm
NOTES: Foodplant of *E. elathea* also recorded in literature as *Zornia* sp. (Papilionaceae).

9. BUTTERFLY: Fam. Pieridae *Eurema lisa euterpe* Menétries (Little Sulphur)
1 larva on stem; 1 pupa on stem; 1 adult female in flight, 1 adult male in flight.
PLANT: Fam. Mimosaceae *Mimosa pudica* L. (Shame Weed)
Stem, leaves and flower. No larval damage.
SIZE: 352 × 251 mm
NOTES: Foodplant of *E. lisa euterpe* recorded in literature as *M. pudica*

10. BUTTERFLY: Fam. Pieridae *Kricogonia lyside* Godart (Lyside)
1 larva on stem; 2 pupae on stem; 1 adult male in flight, 1 adult female in flight.
PLANT: Fam. Zygophyllaceae *Guaiacum officinale* L. (Lignum Vitae)
Stem and leaves. Shows larval damage.
ANNOTATIONS: *r* [ink] 'Chrysalis formed 3d August. Butterfly emerged 9th Aug. 97'
SIZE: 250 × 180 mm
NOTES: Foodplant of *K. lyside* also recorded in literature as *Porlieria* sp. (Zygophyllaceae).

11. BUTTERFLY: Fam. Pieridae *Anteos maerula maerula* Fabricius (Maerula)
1 larva on stem, 1 larva on leaf; 2 pupae on stem; 1 adult male in flight.
PLANT: Fam. Papilionaceae (Fabaceae) *Gliricidia sepium* (Jacq.) Kunth ex Griseb. (Aaron's Rod, Grow Stick, Quick Stick)
Stem and leaves. Shows larval damage.
ANNOTATIONS: *r* [ink] 'Chrysalis formed 10th Nov.'

SIZE: 299 × 235 mm
NOTES: Foodplant of *A. maerula maerula* recorded in literature as *Cassia* sp. (Caesalpiniaceae).

12. BUTTERFLY: Fam. Pieridae *Phoebis sennae sennae* L. (Cloudless Sulphur)
1 larva on stem; 2 pupae on stem; 1 adult female in flight, 1 adult male in flight.
PLANT: Fam. Caesalpiniaceae *Cassia emarginata* L. (Senna Tree, Yellow Candle Wood)
Stem, leaves and flowers. Shows larval damage.
ANNOTATIONS: *r* [ink] 'Chrysalis formed 14th Nov. Butterfly emerged 24th Nov. 1893.'
SIZE: 299 × 238 mm
NOTES: Foodplant of *P. sennae sennae* recorded in literature as *Cassia* sp. (Caesalpiniaceae).

13. BUTTERFLY: Fam. Nymphalidae: Danainae *Danaus gilippus jamaicensis* Bates (Jamaican Queen)
1 larva on stem; 1 pupa on leaf; 1 adult female in flight.
PLANT: Fam. Asclepiadaceae *Asclepias curassavica* L. (Redhead, Red Top)
Stem, leaves and flowers. No larval damage.
ANNOTATIONS: *r* [ink] '1 Chrysalis formed 28th Nov. Butterfly emerged 9th Dec. 1893.'
SIZE: 456 × 239 mm
NOTES: Published in National Gallery of Ireland & Douglas Hyde Gallery (1987).

14. BUTTERFLY: Fam. Nymphalidae: Heliconiinae *Heliconius charitonius simulator* Röbert (Jamaican Zebra)
2 pupae on tendril; 1 adult in flight.
PLANT: Fam. Passifloraceae *Passiflora laurifolia* L. (Golden Apple)
Sketch of tendril.
SIZE: 301 × 236 mm

15. BUTTERFLY: Fam. Nymphalidae: Heliconiinae *Heliconius charitonius simulator* Röbert (Jamaican Zebra)
1 larva on leaf; 1 pupa on leaf; 1 adult in flight.
PLANT: Fam. Passifloraceae *Passiflora laurifolia* L. (Golden Apple)
Stem, leaves, tendrils and flower. No larval damage.
ANNOTATIONS: *r* [ink] 'Chrysalis formed 5th Dec. Butterfly emerged 15th Dec. 1893.'
SIZE: 508 × 239 mm

16. BUTTERFLY: Fam. Nymphalidae: Heliconiinae *Dryas iulia delila* Fabricius (Julia)
1 larva on tendril, 1 larva on leaf; 2 pupae on tendril; 1 adult female in flight, 1 adult male in flight.
PLANT: Fam. Passifloraceae *Passiflora suberosa* L.
Stem, leaves, tendrils, flowers and fruit. Shows larval damage.
ANNOTATIONS: *r* [ink] 'Chrysalis formed 27th Nov. Butterfly emerged 10th Dec. 1893.'
SIZE: 300 × 237 mm
NOTES: Foodplants of *D. iulia delila* recorded in literature as *Passiflora vespertilio* L. and *Passiflora ichthyura* Mast.

17. BUTTERFLY: Fam. Nymphalidae: Heliconiinae *Agraulis vanillae insularis* Maynard (Tropical Silverspot)
2 larvae on leaf; 1 pupa on stem; 1 adult in flight.
PLANT: Fam. Passifloraceae *Passiflora laurifolia* L. (Golden Apple)
Stem, leaves, tendrils and flowers. Shows larval damage.
ANNOTATIONS: *r* [ink] 'Chrysalis formed 25th Dec. 92 Butterfly emerged 5th Jan 93.'
SIZE: 508 × 238 mm
NOTES: Published in National Gallery of Ireland & Douglas Hyde Gallery (1987).

18. BUTTERFLY: Fam. Nymphalidae: Heliconiinae *Agraulis vanillae insularis* Maynard (Tropical Silverspot)
1 larva on leaf; 1 pupa on tendril; 1 adult at rest on leaf.
PLANT: Fam. Passifloraceae *Passiflora laurifolia* L. (Golden Apple)
Stem, leaves and tendrils. Shows larval damage.
ANNOTATIONS: *r* [ink] 'Chrysalis formed 4th Dec. Butterfly emerged 15th Dec. 95'
SIZE: 350 × 249 mm

19. BUTTERFLY: Fam. Nymphalidae *Euptoieta claudia claudia* Cramer (Variegated Fritillary)
2 larvae on leaf; 1 pupa on stem; 1 adult in flight.
PLANT: Fam. Turneraceae *Turnera ulmifolia* L. (Ram-Goat Dashalong)
Stem and leaves. Shows larval damage.
ANNOTATIONS: *r* [ink] 'Chrysalis formed 7th August. Butterfl [sic] emerged 13th Augst. [sic] 97'
SIZE: 350 × 250 mm
NOTES: *E. claudia claudia* is widely polyphagous.

20. BUTTERFLY: Fam. Nymphalidae *Euptoieta claudia claudia* Cramer (Variegated Fritillary)
1 larva; 1 pupa; 1 adult in flight.
PLANT: No plant figured
ANNOTATIONS: *r* [ink] 'Chrysalis formed 16th Oct. 92 Butterfly emerged 31st Oct. 92.'
SIZE: 301 × 236 mm

21. BUTTERFLY: Fam. Nymphalidae *Antillea proclea* Doubleday & Hewitson (Jamaican Crescent-Spot)
3 larvae on leaves; 1 pupa on leaf stem; 1 adult in flight.
PLANT: Fam. Acanthaceae *Dicliptera sexangularis* (L.) Juss.
Stem and leaves. Shows larval damage.
ANNOTATIONS: *r* [ink] 'Chrysalis formed 5th Sept. Butterfly emerged 12th Sept. 93'
SIZE: 507 × 237 mm

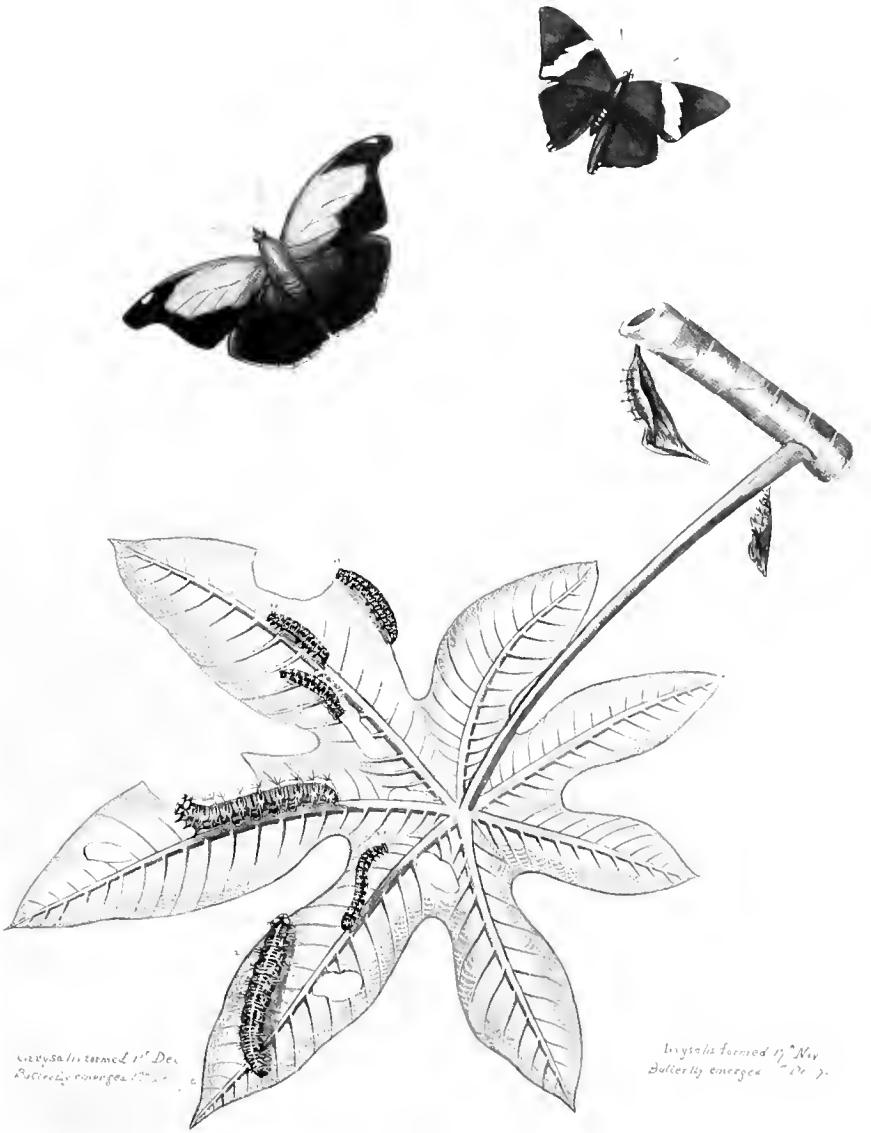
22. BUTTERFLY: Fam. Nymphalidae *Junonia evarete zonalis* Felder & Felder (West Indian Buckeye)
2 larvae on leaves; 1 pupa on stem; 2 adults in flight.
PLANT:: Fam. Plantaginaceae *Plantago virginica* L.
Stem, leaves and flowers. Shows larval damage.
ANNOTATIONS: *r* [ink] 'Chrysalis formed 28th Augst. [sic] Butterfly emerged Sept. 5th 89 Craigton.'
SIZE: 227 × 140 mm
NOTES: Foodplants of *J. evarete zonalis* also recorded in literature as *Stachytarpheta* sp., *Lippia* sp. (Verbenaceae) and *Valeriana* sp. (Valerianaceae).

23. BUTTERFLY: Fam. Nymphalidae *Junonia evarete zonalis* Felder & Felder (West Indian Buckeye)
1 larva on stem; 1 pupa on stem; 1 adult in flight.
PLANT: Fam. Verbenaceae *Stachytarpheta jamaicensis* (L.) Vahl (Porter Weed, Vervine)
Stem, leaves and flowers. Shows larval damage.
ANNOTATIONS: *r* [ink] 'Chrysalis formed 21st Sept. Butterfly emerged [5]th Oct. 1893'
SIZE: 300 × 236 mm
NOTES: Foodplants of *J. evarete zonalis* also recorded in literature as *Stachytarpheta* sp., *Lippia* sp. (Verbenaceae) and *Valeriana* sp. (Valerianaceae).

24. BUTTERFLY: Fam. Nymphalidae *Siproeta stelenes stelenes* L. (Antillean Malachite)
2 larvae on leaf; 1 pupa on leaf stem; 2 adults in flight.
PLANT: Fam. Acanthaceae *Justicia pectoralis* Jacq. (Fresh Cut)
Stem and leaves. Shows larval damage.
ANNOTATIONS: *r* [ink] 'Chrysalis formed 21st August. Butterfly emerged 31st August 97'
SIZE: 351 × 249 mm
NOTES: Foodplants of *S. stelenes stelenes* recorded in literature as *Blechum* sp. and *Ruellia* sp. (Acanthaceae).

25. BUTTERFLY: Fam. Nymphalidae *Anartia jatrophae jamaicensis* Möschler (Jamaican White Peacock)
1 larva on leaf, 1 larva on stem; 1 pupa on stem; 1 adult male in flight.
PLANT: Fam. Acanthaceae *Ruellia tuberosa* L. (Duppy Gun, Menow Weed)
Stem, leaves and fruit. Shows larval damage.
ANNOTATIONS: *r* [ink] 'Chrysalis formed 4th Nov. Butterfly emerged 12th Nov 92.'
SIZE: 300 × 235 mm

No. 24 *Spirocta stelenes stelenes* L. (butterfly); *Justica pectoralis* Jacq. (plant)



No.26 *Historis odius odius* Fabricius (butterfly 1); *Colobura dirce avinoffi* Comstock (butterfly 2), *Cecropia peltata* L. (plant)

26. BUTTERFLY: [1] Fam. Nymphalidae *Historis odius odius* Fabricius (Orion)
1 pupa on stem; 1 adult in flight.
BUTTERFLY: [2] Fam. Nymphalidae *Colobura dirce avinoffi* Comstock (Dirce)
1 pupa on stem; 1 adult in flight.
PLANT: Fam. Cecropiaceae *Cecropia peltata* L. (Snake Wood, Trumpet Tree)
Stem and leaf. Shows larval damage.
ANNOTATIONS: *r* [ink] '1. Chrysalis formed 17th Nov. Butterfly emerged 5th Dec. 92'; '2. Chrysalis formed 1st Dec. Butterfly emerged 18th Dec. 92'
SIZE: 457 × 330 mm
NOTES: 6 larvae are shown on a leaf but are not sufficiently distinct to distinguish between the two species.

27. BUTTERFLY: Fam. Nymphalidae *Mestra dorcas* Fabricius (Dorcas)
3 larvae on stem; 2 pupae on stem; 1 adult in flight.
PLANT: Fam. Euphorbiaceae *Tragia volubilis* L. (Twining Cowitch)
Stem, leaves, flowers and fruit. No larval damage.
ANNOTATIONS: *r* [ink] 'Chrysalis formed 9th Sept. Butterfly emerged 17th Sept. 97'
SIZE: 352 × 249 mm

28. BUTTERFLY: Fam. Nymphalidae *Adelpha abyla* Hewitson (Jamaican Admiral)
2 larvae on leaf; 2 pupae on leaf; 1 adult in flight.
PLANT: Fam. Rubiaceae *Mussaenda treutleri* Stapf.
Stem, leaves and flowers. Shows larval damage.
ANNOTATIONS: *r* [ink] 'Chrysalis formed 17th August. Butterfly emerged 26th August. 97'
SIZE: 351 × 249 mm
NOTES: *M. treutleri* is a cultivated ornamental, native of tropical Asia.

29. BUTTERFLY: [1] Fam. Lycaenidae *Heterosmaitia bourkei* Kaye (Bourke's Hairstreak)
2 larvae on flowers, 1 larva on stem; 1 pupa on leaf, 1 pupa on stem; 1 adult male in flight.
MOTH: [2] Fam. Geometridae
4 larvae on leaves; 2 adults in flight.
PLANT: Fam. Sterculiaceae *Waltheria indica* L. (Raichie)
Stem, leaves and flowers. No larval damage.
ANNOTATIONS: *r*[ink] '1 Chrysalis formed 30th August. 1 Butterfly emerged 12th Sept 93. 2 Chrysalis formed 9th Sept 2 Moth emerged 21st Sept. 1893.'; *v* [pencil] 'Chrysallis 2 formed 9th Sept.'
SIZE: 306 × 243 mm

30. BUTTERFLY: Fam. Hesperiidae *Urbanus proteus* L. (Common Tailed Skipper)
1 larva on leaf; 1 pupa on leaf; 1 adult male in flight.
PLANT: Fam. Papilionaceae (Fabaceae) *Centrosema virginianum* (L.) Benth.
Stem, leaves and pod. No larval damage.
ANNOTATIONS: *r* [ink] 'Chrysalis formed 18th Jan 93 Butterfly emerged 5th Feb.'
SIZE: 300 × 236 mm
NOTES: *U. proteus* is polyphagous.

31. BUTTERFLY: Fam. Hesperiidae *Polygonus leo hagar* Evans (Evans' Jamaican Skipper)
2 larvae on leaf; 1 pupa on leaf; 1 adult in flight.
PLANT: Fam. Papilionaceae (Fabaceae) *Piscidia piscipula* (L.) Sarg. (Dogwood)
Stem and leaves. Shows larval damage.
ANNOTATIONS: *r* [ink] 'Chrysalis formed 11th Dec. Butterfly emerged 29th Dec 1893.'
SIZE: 509 × 239 mm
NOTES: Foodplants of *P. leo hagar* recorded in literature as *Piscidia* sp., *Derris* sp., and *Lonchocarpus* sp. (Papilionaceae).

32. BUTTERFLY: Fam. Hesperiidae *Aguna asander jasper* Evans (Asander)
1 larva on leaf; 1 pupa on leaf; 1 adult in flight.
PLANT: Fam. Caesalpiniaceae Possibly *Bauhinia monandra* Kurz
Stem and leaves. Shows larval damage.
ANNOTATIONS: *r* [ink] 'Chrysalis formed 12th June. Butterfly emerged 30th July. 1893'

SIZE: 300 × 235 mm
NOTES: Foodplant of *A. asander jasper* recorded in literature as in Leguminosae.

33. BUTTERFLY: Fam. Hesperiidae *Cabares potrillo potrillo* Lucas (Lucas Skipper)
2 larvae on leaves; 1 pupa on leaf; 1 adult in flight.
PLANT: Fam. Verbenaceae *Priva lappulacea* (L) Pers. (Clammy Bur, Fasten-'pon-Coat, Styptic Bur, Velvet Bur)
Stem, leaves and burs. Shows larval damage.
ANNOTATIONS: *r* [ink] 'Chrysalis formed about 16th Nov. Butterfly emerged 27th Dec. 1892.'
SIZE: 300 × 234 mm
NOTES: Foodplants of *C. potrillo potrillo* recorded in literature as *Schrankia* sp. (Mimosaceae) and *Indigofera* sp. (Papilionaceae).

34. BUTTERFLY: Fam. Hesperiidae *Ephyriades zephodes* Hübner or *E. arcas phileman* Fabricius (Hübner's Hairy Dusky Wing or Fabricius' Hairy Dusky Wing)
1 larva on leaf; 1 pupa on leaf; 1 adult in flight.
PLANT: Fam. Possibly Moraceae *Ficus* sp.
Stem and leaves. Shows larval damage.
ANNOTATIONS: *v* [pencil] 'Butterfly emerged 2nd March'
SIZE: 300 × 239 mm
NOTES: The two butterfly species are virtually indistinguishable in general features.

35. BUTTERFLY: Fam. Hesperiidae *Gesta gesta gesta* Herrich-Schäffer (Common Dusky Wing)
1 larva on leaf; 1 pupa on leaf; 1 adult in flight.
PLANT: Fam. Papilionaceae (Fabaceae) Possibly *Sesbania* sp. or *Tephrosia* sp.
Stem and leaves. No larval damage.
ANNOTATIONS: *r* [ink] '1 Chrysalis formed 16th August. Butterfly emerged 25th Aug 97'; '2 Caterpillar fastened itself up 22 August. Moth emerged 2d Sept 97'
SIZE: 238 × 161 mm

36. BUTTERFLY: Fam. Hesperiidae Possibly *Gesta gesta gesta* Herrich-Schäffer (Common Dusky Wing)
1 larva on leaf; 1 pupa on leaf; 1 adult in flight.
PLANT: Fam. Papilionaceae (Fabaceae) *Indigofera suffruticosa* Mill. (Guatemala Indigo, Markham Gungo, Wild Indigo)
Stem and leaves. Shows larval damage.
ANNOTATIONS: *r* [ink] 'Chrysalis formed 21st Feb. Butterfly emerged 5th March. 94'; *v* [pencil] '1 Chrysalis 21st Feb [chrysalis] 26th Feb'
SIZE: 300 × 239 mm

37. MOTH: [1] Fam. Tortricidae *Platynota* sp.
1 adult in flight.
BUTTERFLY: [2] Fam. Hesperiidae *Anastrus sempiternus dilloni* Bell & Comstock (Dillon's Dusky Wing)
1 larva on leaf; 1 pupa on leaf; 1 adult in flight.
PLANT: Fam. Myrtaceae *Psidium guajava* L. (Guava)
Stem and leaves. Shows larval damage.
ANNOTATIONS: *r* [ink] '1 Chrysalis formed 6th Feb. Moth emerged 19th Feb. 1894'; '2 Chrysalis formed 18th Feb. Butterfly emerged 2d March. 94'; *v* [pencil] 'Small Chrysalis 6th Feb'; '[indecipherable] 18th Feb'
SIZE: 300 × 238 mm
NOTES: Foodplant of *A. sempiternus guajava* recorded in literature as *P. guajava*.

38. BUTTERFLY: Fam. Hesperiidae *Pyrgus oileus* L. (Syrichtus) 3 larvae on leaves; 1 pupa on leaf; 1 adult in flight.
PLANT: Fam. Malvaceae *Sida acuta* Burm. f. (Broomweed)
Stem, leaves, flowers and buds. No larval damage.
ANNOTATIONS *r* [ink] 'Chrysalis formed 14th Sept. Butterfly emerged 26th Sept 1893.'; *v* [pencil] 'Chrysalis formed 14th Sept'
SIZE: 300 × 236 mm
NOTES: Foodplant of *P. oileus* recorded in literature as *Sida rhombifolia* L.

39. BUTTERFLY: Fam. Hesperiidae *Pyrrhocalles jamaicensis* Schaus (Schaus' Skipper)
1 larva on leaf; 1 pupa on leaf; 1 adult in flight.
PLANT: Fam. Palmae (Arecaceae) *Cocos nucifera* L.
1 leaf. Shows larval damage.
ANNOTATIONS: *r* [ink] 'Chrysalis formed 4th Feb. Butterfly emerged 22nd Feb. 1894'; 'Pamphila utho = Hewitson'; *v* [pencil] 'Chrysalis 4th Feb'
SIZE: 330 × 456 mm

40. BUTTERFLY: Fam. Hesperiidae *Calpodes ethlius* Stoll (Canna Skipper)
1 larva on leaf; 1 pupa on leaf; 1 adult in flight.
PLANT: Fam. Possibly Heliconiaceae *Heliconia* sp. or Cannaceae *Canna* sp.
1 leaf. Shows larval damage.
ANNOTATIONS: *r* [ink] 'Chrysalis formed 23rd Oct. Moth emerged 7th Nov. 92.'
SIZE: 300 × 235 mm

41. BUTTERFLY: Fam. Hesperiidae *Nyctelius nyctelius nyctelius* Latreille (Latreille's Cane Skipper)
2 larvae on leaves; 1 pupa on leaf; 1 adult in flight.
PLANT: Fam. Gramineae (Poaceae)
Leaves. Shows larval damage.
ANNOTATIONS: *r* [ink] 'Chrysalis formed 15th Jan. Butterfly emerged 1st Feb. 93'; 'The last few days before the perfect insect emerges the chrysalis becomes of a dark colour'
SIZE: 300 × 236 mm

42. BUTTERFLY: Fam. Hesperiidae *Panoquina sylvicola woodruffi* Watson (Watson's Cane Skipper)
1 larva on leaf; 1 pupa on leaf; 1 adult in flight.
PLANT: Fam. Gramineae (Poaceae) Possibly *Panicum maximum* Jacq.
Leaves. Shows larval damage.
ANNOTATIONS: *r* [ink] 'Chrysalis formed 27th Nov. Butterfly emerged 7th Dec. 96'
SIZE: 352 × 249 mm

43. Butterfly: Fam. Hesperiidae *Perichares philetes philetes* Gmelin (Confusing Branded Skipper)
2 larvae on leaf; 1 pupa on leaf, 1 pupa drawn separately; 2 adults in flight.
PLANT: Fam. Gramineae (Poaceae) Possibly *Panicum maximum* Jacq.
Leaves. Shows larval damage.
ANNOTATIONS: *r* [ink] 'Chrysalis formed 10th Jan. Butterfly emerged 26th Jan. 94'; 'Pamphila juliana = Hesperia carydon Fabr.'; *v* [pencil] 'Chrysalis 10th Jan'
SIZE: 354 × 185 mm

44. LEPIDOPTERA: [1] Unidentified
1 larva on leaf; 1 pupa on stem.
MOTH: [2] Fam. Possibly Lycaenidae
1 larva on leaf.
PLANT: [1] Fam. Papilionaceae (Fabaceae) *Stylosanthes hamata* (L.) Taub. (Cheesy Toes, Donkey Weed, Pencil Flower)
Stem, leaves and flower. Shows larval damage.
PLANT: [2] Fam. Gramineae (Poaceae)
Leaves. Shows larval damage.
SIZE: 248 × 351 mm

45. LEPIDOPTERA: No Lepidoptera figured
PLANT: Fam. Boraginaceae Probably *Tournefortia hirsutissima* L.
Stem and leaves. Shows larval damage.
SIZE: 350 × 250 mm
NOTES: A rolled leaf is figured but the identification of the insect responsible is not possible. The leaf damage and leaf rolling might be the work of a pyralid moth larva.

46. LEPIDOPTERA: No Lepidoptera figured
PLANT: Fam. Mimosaceae *Acacia macracantha* Humb. & Bonpl. ex Willd. (Park Nut)
Stem, leaves and fruit. No larval damage.

ANNOTATIONS: *r* [ink] 'King's House 4th August 97.'
SIZE: 253 × 354 mm

47. MOTH: Fam. Possibly Tortricidae
1 larva on leaf.
PLANT: Fam. Compositae (Asteraceae) *Synedrella nodiflora* (L.) Gaertn. (Fatten Barrow)
Stem, leaves and flowers. No larval damage.
SIZE: 239 × 125 mm

48. MOTH: Fam. Possibly Tortricidae
1 larva on leaf.
PLANT: Fam. Solanaceae *Browallia americana* L. (Jamaican Forget-me-not)
Stem, leaves and flowers. No larval damage.
SIZE: 301 × 237 mm
NOTES: Unfinished sketch.

49. MOTHS: Fam. Notodontidae
1 larva on leaf.
PLANT: Fam. Myrtaceae *Psidium guajava* L. (Guava)
Stem and leaves. Shows larval damage.
SIZE: 352 × 248 mm

50. MOTH: Fam. Arctiidae: Pericopinae *Hyalurga leucophaea* Walker
2 larvae on leaf; 1 pupa on leaf; 1 adult male in flight, 1 adult female in flight.
PLANT: Fam. Boraginaceae *Heliotropium indicum* L. (Scorpion Weed, Wild Clary)
Stem, leaves and flowers. Shows larval damage.
ANNOTATIONS: *r* [ink] 'Chrysalis formed about 12th Dec Moth emerged 23d Dec. 1892.'
SIZE: 300 × 235 mm

51. MOTH: Fam. Pyralidae: Pyraustinae *Stenoptycha* sp.
1 larva on leaf; 1 pupa on leaf; 1 adult male in flight, 1 adult female at rest.
PLANT: Fam. Solanaceae *Capsicum frutescens* L. (Bird Pepper, Cayenne Pepper, Chilli)
Stem, leaves, flower and fruit.
ANNOTATIONS: *r* [ink] 'Chrysalis formed 1st March. Moth emerged 11th March. 94'; *v* [pencil] '1st March Chrysalis formed 30th July'
SIZE: 300 × 236 mm
NOTES: Details of the wing markings are unclear. At least two species of this Pterophorid-like genus occur in Jamaica, *S. pterophoralis* Walker and *S. fontella* Hampson. A third undescribed species is known from the BM(NH) collection. The illustration appears closest to *S. pterophoralis*.

52. MOTH: [1] Fam. Geometridae
1 larva on leaf; 1 pupa drawn separately; 2 adults in flight.
MOTH: [2] Fam. Pterophoridae
2 larvae on stems; 1 pupa on leaf; 2 adults in flight.
MOTH: [3] Fam. Geometridae
2 larvae on stems; 1 pupa drawn separately; 2 adults in flight.
PLANT: Fam. Nyctaginaceae *Boerhavia coccinea* Mill. (Hog Weed)
Stem, leaves and flowers. Shows larval damage.
ANNOTATIONS: *r* [ink] '1 Chrysalis formed 17th Jan Moth emerged 31st Jan'; '2 Chrysalis formed 21st Jan. Moth emerged 28th Jan. 95'; '3 Chrysalis formed 17th Jan Moth emerged 29th Jan'
SIZE: 356 × 255 mm

53. MOTH: [1] Fam. Pyralidae: Pyraustinae Probably *Syngamia haemorrhoidalis* Guenée
1 larva on leaf; 1 pupa on leaf; 1 adult in flight.
MOTH: [2] Fam. Arctiidae: Pericopinae *Syntomodopsis variegata* Walker
1 adult male at rest.
MOTH: [3] Fam. Ctenuchidae *Dinia mena* Hübner
1 adult male at rest.

LIZARD: Fam. Iguanidae *Anolis* sp.
On stem.
PLANT: Fam. Papilionaceae (Fabaceae) Possibly *Desmodium tortuosum* (Sw.) DC.
Stem and leaves. No larval damage.
ANNOTATIONS: *r* [ink] 'Chrysalis formed 29th August. Moth emerged 8th Sept. 1983'
SIZE: 306 × 242 mm

54. MOTH: Fam. Arctiidae: Ctenuchinae *Eunomia rubripunctata* Butler
1 larva on leaf, 1 larva on stem; 1 pupa on stem; 1 adult male in flight.
PLANT: Fam. Convolvulaceae *Merremia quinquefolia* (L.) Hallier f. (Rock Rosemary) or *M. aegyptia* (L.) Urb.
Stem and leaves. Shows larval damage.
ANNOTATIONS: *r* [ink] 'Chrysalis formed 23d Jan. Moth emerged 13th Feb. 93.'
SIZE: 360 × 242 mm

55. MOTH: Fam. Arctiidae: Ctenuchinae *Empyreuma anassa* Forbes
1 larva on stem, 1 larva on leaf; 1 pupa suspended from stem; 1 adult male in flight.
PLANT: Fam. Apocynaceae *Urechites lutea* (L.) Britton (Nightsage, Nightshade)
Stem, leaves and flower. No larval damage.
ANNOTATIONS: *r* [ink] 'Chrysalis formed 12th July Moth emerged 30th July 1892.'
SIZE: 300 × 236 mm

56. MOTH: Fam. Arctiidae: Ctenuchinae *Cosmosoma auge* L.
1 larva on leaf; 1 cocoon on leaf; 2 adult males in flight.
PLANT: Fam. Compositae (Asteraceae) *Mikania micrantha* Kunth (Guaco)
Twining stem and leaves. Shows larval damage.
ANNOTATIONS: *r* [ink] 'Craighton. Chrysalis formed 16th August. The chrysalis was white till the 27th August when the fore part became brown, on the 28th the whole chrysalis was brown. Moth emerged 29th August 1892.'
SIZE: 300 × 235 mm

57. MOTH: Unidentified
2 larvae on leaves; 1 pupa drawn separately: 1 adult in flight.
PLANT: Fam. Boraginaceae *Ehretia tinifolia* L. (Bastard Cherry)
Stem, leaves and fruit. Shows larval damage.
ANNOTATIONS: *r* [ink] 'Chrysalis formed 29th Nov. Moth emerged 10th Dec. 1893'
SIZE: 300 × 236 mm

58. MOTH: Fam. Arctiidae *Paraeuchaetes insulata* Walker
1 larva on leaf; 1 pupa on leaf; 1 adult male in flight.
PLANT: Fam. Compositae (Asteraceae) *Eupatorium odoratum* L. (Christmas Bush, Jack-in-the-hush)
Stem, leaves and flowers. No larval damage.
ANNOTATIONS: *r* [ink] 'Chrysalis formed 5th July Moth emerged 19th July 1893.'; *v* [pencil] 'Chrysalis formed 5th July'
SIZE: 300 × 235 mm

59. Moth: Fam. Arctiidae *Ammalo* sp.
2 larvae on leaf; 1 pupa rolled in dead leaf still attached to stem; 1 adult female in flight.
PLANT: Fam. Moraceae *Ficus* sp.
Stem and leaves. No larval damage.
ANNOTATIONS: *r* [ink] 'Chrysalis formed 20th Dec. 91 Moth emerged 28th Jan 92'
SIZE: 300 × 236 mm

60. MOTH: Fam. Arctiidae *Hypercompe nigriplaga* Walker
1 larva on leaf, 1 larva drawn separately; 1 pupa drawn separately; 1 adult female in flight.
PLANT: Fam. Rosaceae *Rosa* sp. (Rose (cultivated))
Stem, leaves and flower. No larval damage.
ANNOTATIONS: *r* [ink] 'Chrysalis formed 17th Dec. 92 Moth emerged 14th Jan. 93';

'Caterpillar was found under a tussock of grass. Foodplant unknown, but I kept the caterpillar for a month on pink roses, which it ate greedily.'
SIZE: 300 × 235 mm

61. MOTH: Fam. Arctiidae *Amastus ramona* Schaus
1 larva on leaf; 1 pupa on leaf; 1 adult male in flight.
PLANT: Fam. Cecropiaceae *Cecropia peltata* L. (Snake Wood, Trumpet Tree)
Stem and leaves. Shows larval damage.
ANNOTATIONS: *r* [ink] 'Chrysalis formed 7th March. Moth emerged 16th April 97.'
Size: 328 × 451 mm

62. MOTH: Fam. Arctiidae *Utetheisa bella* L.
1 larva on stem, 1 larva on flower; 1 pupa suspended from leaf; 2 adult males in flight.
PLANT: Fam. Papilionaceae (Fabaceae) *Crotalaria retusa* L. (Rattleweed)
Stem, leaves, flowers and immature pods. No larval damage.
ANNOTATIONS: *r* [ink] 'Chrysalis formed about 18th May 91 Moth emerged 29th May 91'
SIZE: 355 × 161 mm

63. MOTH: Fam. Lymantriidae
1 larva on leaf; 1 pupa on leaf.
PLANT: Fam. Rubiaceae *Rondeletia* sp.
Stem, leaves and flowers. Shows larval damage.
ANNOTATIONS: *r* [ink] 'Chrysalis formed 7th Sept'
SIZE: 240 × 179 mm

64. MOTH: Fam. Arctiidae: Pericopinae *Composia credula* Fabricius
3 larvae on leaves; 1 pupa suspended between leaf and stem; 1 adult male in flight.
PLANT: Unidentified
Twining stem and leaves. Shows larval damage.
ANNOTATIONS: *r* [ink] 'Chrysalis formed 26th Jan. Moth emerged 13th Feb 1893'
SIZE: 300 × 235 mm

65. MOTH: Fam. Arctiidae *Paraeuchaetes insulata* Walker
1 larva on leaf; 1 pupa on leaf; 1 adult male in flight.
PLANT: Fam. Compositae (Asteraceae) *Eupatorium odoratum* L. (Christmas Bush, Jack-in-the-Bush)
Stem and leaves. Shows larval damage.
ANNOTATIONS: *r* [ink] 'Caterpillar spun itself up. 10th Feb. Moth emerged 26th Feb. 97.'
SIZE: 352 × 246 mm

66. MOTH: Fam. Possibly Lymantriidae
1 larva on leaf, 1 larva on flower, 1 larva in cocoon; 1 cocoon on stem, 1 cocoon drawn separately; 1 adult in flight.
DIPTERA: Fam. Tachinidae
2 puparia: 2 adults in flight.
PLANT: Fam. Solanaceae *Datura candida* (Pers.) Safford (Angel's Trumpet)
Stem, leaves and flower. Shows larval damage.
ANNOTATIONS: *r* [ink] 'Solandra Longiflora Cinchona. 19th July. 90.'
SIZE: 328 × 240 mm

67. MOTH: Fam. Noctuidae: Agaristinae *Euschirropterus poeyi* Grote
2 larvae on plant; 1 pupa drawn separately; 1 adult female in flight.
PLANT: Fam. Nyctaginaceae *Pisonia aculeata* L. (Cockspur, Fingrigo, Wait-a-bit)
Stem and leaves. Shows larval damage.
ANNOTATIONS: *r* [ink] 'King's House. July 1892'
SIZE: 301 × 236 mm

68. MOTH: Fam. Arctiidae: Pericopinae *Are marginata* Drury
2 larvae on leaves; 1 pupa drawn separately; 1 adult female in flight.
PLANT: Fam. Compositae (Asteraceae) *Mikania micrantha* Kunth (Guaco)
Stem and leaves. No larval damage.

ANNOTATIONS: *r* [ink] 'Chrysalis formed 15th Oct 92 Moth emerged 7th Nov. 92.'
SIZE: 226 × 140 mm

69. MOTH: Fam. Arctiidae: Pericopinae *Are marginata* Drury
2 larvae on leaves; 1 pupa suspended from leaf, last larval skin also present; 2 adult males in flight.
PLANT: Fam. Gesneriaceae *Besleria lutea* L.
Stem, leaves, flower-buds and fruit. Shows larval damage.
ANNOTATIONS: *r* [ink] 'Besleria Lutea Chrysalis formed 21st Dec. 93 Moth emerged 23d Jan 94'; *v* [pencil] 'turned about 26th Nov.'; '31st Dec'
SIZE: 514 × 242 mm

70. MOTH: Fam. Arctiidae: Pericopinae *Are marginata* Drury
1 larva on leaf; 1 pupa suspended from leaf, last larval skin also present; 1 adult male in flight, 1 adult male at rest.
PLANT: Fam. Gesneriaceae *Besleria lutea* L.
Stem, leaves and flower-buds. Shows larval damage.
ANNOTATIONS: *r* [ink] 'Chrysalis formed at King's House 17th Moth. [sic] [March] Moth emerged on board the 'Atrat.[o]' 10th April. 94.'; *v* [pencil] 'Spun up 13th. March Chrysalis 17th March'
SIZE: 506 × 240 mm

71. MOTH: Fam. Pyralidae: Pyraustinae Possibly *Samea* sp.
1 larva on leaf; 1 pupa in leaf with edges spun together; 1 adult in flight.
PLANT: Fam. Labiatae (Lamiaceae) *Hyptis suaveolens* (L.) Poit. (Pignut, Spikenard)
Stem and leaves. Shows larval damage.
ANNOTATIONS: *r* [ink] 'Chrysalis formed 17th Nov. Moth emerged 29th Nov 95'
SIZE: 382 × 240 mm

72. MOTH: Fam. Noctuidae: Catocalinae (Ophiderinae) *Ascalapha odorata* L. (Black Witch)
1 larva on stem; 1 pupa drawn separately; 1 adult male in flight.
PLANT: Fam. Mimosaceae *Albizia lebbeck* (L.) Benth. (Woman's Tongue Tree)
1 leaf. No larval damage.
ANNOTATIONS: *r* [ink] '5th August 92 Jamaica. Chrysalis formed 22d July. Moth emerged 10th August.'
SIZE: 370 × 239 mm
NOTES: Foodplants of *A. odorata* recorded in literature as *Cassia* sp. (Caesalpiniaceae) and *Acacia greggii* A. Gray (Mimosaceae).

73. MOTH: Fam. Geometridae: Ennominae Probably *Oxydia* sp.
1 larva on stem, 1 larva on leaf; 1 pupa drawn separately; 1 adult in flight.
PLANT: Fam. Rutaceae *Citrus* sp. (Possibly Orange)
Stems and leaves. Shows larval damage.
ANNOTATIONS: *r* [ink] 'Chrysalis formed 7th May Moth emerged 19th May 96'
SIZE: 351 × 248 mm

74. MOTH: [1] Fam. Noctuidae: Catocalinae (Ophiderinae) *Gonodonta incurva* Sepp
2 larvae on leaf; 1 pupa on stem; 1 adult male in flight, 1 adult female in flight.
MOTH: [2] Fam. Noctuidae: Catocalinae (Ophiderinae) *Gonodonta uxoria* Stoll
1 larva on leaf; 1 adult in flight.
PLANT: [1] Fam. Piperaceae *Piper aduncum* L.
Stem and leaves. Shows larval damage.
PLANT: [2] Fam. Piperaceae *Pothomorphe umbellata* (L.) Miq. (= *Lepianthes umbellata* (L.) Raf.) (Cow Foot)
Stem and leaves. Shows larval damage.
ANNOTATIONS: *r* [ink] 'Chrysalis formed 15th O[c]tober See my notes on natural history p. 54.'
SIZE: 355 × 321 mm

75. MOTH: Fam. Noctuidae: Catocalinae (Ophiderinae) *Anomis erosa* Hübner (Yellow Scallop Moth)

3 larvae on stem; 1 pupa on leaf; 1 adult female in flight.
PLANT: Fam. Malvaceae *Wissadula fadyenii* Planch. ex R. E. Fries
Stem, leaves and dead flowers. Shows larval damage.
ANNOTATIONS: *r* [ink] '1 Chrysalis formed 22d Nov. Moth emerged 2 Dec 96'
SIZE: 443 × 239 mm
NOTES: Moth may possibly be *Anomis flava fimbriago* Stephens which is recorded on Malvaceae.

76. MOTH: Fam. Pyralidae: Odontiinae *Dichogama* sp., probably *D. redtenbacheri* Lederer
1 larva on leaf; 1 pupa on leaf; 1 adult female in flight.
PLANT: Unidentified
Stem and leaves. Shows larval damage and dipterous leaf mines.
ANNOTATIONS: *r* [ink] 'Chrysalis formed 7th Jan. Moth emerged 2d Feb. 94'; *v* [pencil] 'Spun up 7th Jan'
SIZE: 300 × 235 mm
NOTES: *D. redtenbacheri* is a highly variable species which can produce dark forms almost devoid of markings.

77. MOTH: Fam. Noctuidae: Amphipyrinae *Spodoptera frugiperda* J. E. Smith (Fall Armyworm)
2 larvae on leaves, 1 larva on ground; 1 pupa drawn separately; 1 adult male in flight, 1 adult female in flight.
PLANT: Unidentified graminoid
Grasslike leaves.
ANNOTATIONS: *r* [ink] 'Chrysalis formed 8th June. Moth emerged 18th June. 97'
SIZE: 350 × 249 mm
NOTES: *S. frugiperda* is a well-known pest of grasses, cereals and other crops.

78. MOTH: Fam. Noctuidae: Catocalinae *Zale fictilis* Guenée
2 larvae on grass; 1 pupa on ground; 1 adult in flight.
PLANT: Grasslike monocotyledon
Leaves.
ANNOTATIONS: *r* [ink] 'Chrysalis formed 16th Jan. Moth emerged 3d Feb. 1894.'; 'Homoptera terrosa = Guenée'; *v* [pencil] 'Chrysalis 16th Jan'
SIZE: 300 × 238 mm
NOTES: *Z. fictilis* is the senior name for *H. terrosa*.

79. MOTH: Fam. Noctuidae: Amphipyrinae *Spodoptera androgea* Stoll form *rubrifusa* Hampson
1 larva on stem; 1 pupa drawn separately; 1 adult female in flight.
PLANT: Fam. Possibly Leguminosae
Stem and leaves. Shows larval damage.
ANNOTATIONS: *r* [ink] 'Caterpillar buried itself 10th Sept. Moth emerged 5th Oct 1893.'; *v* [pencil] 'Caterpillar buried itself 10th Sept'
SIZE: 300 × 236 mm
NOTES: This form of *S. androgea* is more or less restricted to Jamaica. It is polyphagous.

80. MOTH: Fam. Noctuidae: Noctuinae *Agrotis* sp.
1 larva on leaf; 1 pupa drawn separately; 1 adult male in flight.
PLANT: Fam. Solanaceae *Solanum tuberosum* L. (Irish Potato)
1 leaf. Shows larval damage.
ANNOTATIONS: *r* [ink] 'Chrysalis formed 20 or 21st Sept. Moth emerged 8th Oct. 92'
SIZE: 220 × 235 mm
NOTES: *S. tuberosum* is an introduced species in cultivation.

81. MOTH: Fam. Noctuidae: Amphipyrinae *Spodoptera ornithogalli* Guenée (Yellow-striped Armyworm)
1 larva on stem, 1 larva on leaf; 1 pupa drawn separately; 1 adult male in flight.
PLANT: Fam. Geraniaceae *Pelargonium* sp.
Stem and leaves. No larval damage.
SIZE: 292 × 160 mm
NOTES: *S. ornithogalli* is polyphagous. *Pelargonium* is a cultivated ornamental.

82. MOTH: Noctuidae: Catocalinae (Ophiderinae) *Anomis editrix* Guenée
1 larva on stem; 1 pupa rolled in leaf; 1 adult in flight.
PLANT: Fam. Tiliaceae *Triumfetta semitriloba* Jacq. (Bur Weed)
Stem and leaves. Shows larval damage.
ANNOTATIONS: *r* [inc] 'From Montpelier. Caterpillar rolled itself in leaf 8th Sept. Moth emerged 18th Sept. 95'
SIZE: 349 × 249 mm

83. MOTH: Fam. Possibly Noctuidae
1 larva on leaf; 1 pupa on leaf; 1 adult male in flight, 1 adult male at rest.
PLANT: Fam. Malvaceae *Urena lobata* L. (Ballard Bush, Bur Mallow)
Stem and leaves. Shows larval damage.
ANNOTATIONS: *r* [ink] 'Chrysalis formed 15th August. Moth emerged 25th August 95.'; *v* [pencil] 'Chrysalis formed 15th August.'
SIZE: 349 × 249 mm
NOTES: Pencil sketches of unidentified birds on recto.

84. MOTH: [1] Fam. Pyralidae *Pilocrocis* sp.
1 larva on leaf; 1 pupa on leaf; 2 adults in flight.
MOTH: [2] Fam. Noctuidae
2 larvae on leaf; 1 pupa drawn separately; 2 adult males in flight.
PLANT: Fam. Solanaceae *Dunalia arborescens* (L.) Sleumer or *Nicotiana* sp.
1 leaf. Shows larval damage.
ANNOTATIONS: *r* [ink] '1 Chrysalis formed 24th Jan Moth emerged 6th Feb. 95 2 Chrysalis formed 27th Jan. Moth emerged 16th Feb 95'
SIZE: 255 × 356 mm

85. MOTH: Fam. Noctuidae: Hadeninae *Xanthopastis timais* Cramer (Spanish Moth)
1 larva on leaf; 1 pupa drawn separately; 1 adult in flight.
PLANT: Fam. Amaryllidaceae Possibly *Crinum* sp. or *Hippeastrum* sp.
Part of leaf blade. Shows larval damage.
ANNOTATIONS: *r* [ink] 'Chrysalis formed 18th Sept 89 Moth emerged 6th October 89'
SIZE: 226 × 140 mm
NOTES: Foodplants of *X. timais* recorded in literature as *Ficus carica* L. (Moraceae) and *Hippeastrum puniceum* (Lam.) Kuntze, *Narcissus* sp. (Amaryllidaceae).

86. MOTH: Fam. Noctuidae
2 larvae on leaf; 1 pupa on leaf; 1 adult male in flight.
PLANT: Fam. Possibly Solanaceae
Stem and leaves. Shows larval damage.
ANNOTATIONS: *r* [ink] 'Caterpillar fastened itself into leaf 17th Aug Moth emerged 29th Aug. 95'; 'Montpelier'; *v* [pencil] 'Caterpillar fastened itself up 16th August'
SIZE: 250 × 349 mm

87. MOTH: Fam. Noctuidae: Catocalinae (Ophiderinae) *Thysania zenobia* Cramer (Owl Moth)
2 larvae on leaves; 1 pupa spun up in leaves; 1 adult male in flight, 1 adult female in flight.
PLANT: Fam. Leguminosae Possibly *Cassia* sp.
Stem and leaves. Shows larval damage.
ANNOTATIONS: *r* [ink] 'Caterpillar fastened itself up in the leaves 7th August. Moth emerged 24th August 97'
SIZE: 351 × 249 mm
NOTES: Foodplant of *T. zenobia* recorded in literature as in Leguminosae.

88. MOTH: Fam. Noctuidae
1 larva on leaf; 1 pupa drawn separately; 1 adult in flight, 1 adult at rest.
PLANT: Grasslike monocotyledon
Stem and leaves. No larval damage.
ANNOTATIONS: *r* [ink] 'Chrysalis formed 10th March. Moth emerged 22d March 95'; 'This caterpillar devoured two skipper larvae found also on the Para grass'
SIZE: 356 × 256 mm

89. MOTH: Unidentified
2 larvae on leaves; 1 pupa drawn separately; 1 adult male in flight.
PLANT: Fam. Possibly Ericaceae or Myrsinaceae
Stem and leaves. Shows larval damage.
ANNOTATIONS: *r* [ink] 'Caterpillar buried itself 29th May Moth emerged 10th June 96'
SIZE: 249 × 189 mm

90. MOTH: Fam. Noctuidae: Amphipyrinae *Spodoptera latifascia* Walker
2 larvae on stem; 1 pupa drawn separately; 1 adult male in flight.
PLANT: Fam. Labiatae (Lamiaceae) *Hyptis suaveolens* (L.) Poit. (Pignut, Spikenard)
Stem and leaves. Shows larval damage.
ANNOTATIONS: *r* [ink] 'Chrysalis formed 9th Nov. Moth emerged 25th Nov. 96'
SIZE: 352 × 248 mm
NOTES: *S. latifascia* is polyphagous.

91. MOTH: Fam. Noctuidae: Acontiinae *Bagisara repanda* Fabricius.
1 larva on leaf, 1 larva on stem; 1 pupa drawn separately; 1 adult in flight.
PLANT: Fam. Malvaceae *Sida* sp. or *Malvastrum* sp.
Stem and leaves. Shows larval damage.
ANNOTATIONS: *r* [ink] 'Chrysalis formed 29th Dec 93 Moth emerged 19th Jan. 94'; *v* [pencil] 'Chrysalis 29th Dec'
SIZE: 300 × 238 mm

92. MOTH: Fam. Geometridae
2 larvae on stem; 1 adult in flight.
PLANT: Fam. Caesalpiniaceae *Cassia pilosa* L.
Stem, leaves, flowers and seed pods. No larval damage.
SIZE: 301 × 235 mm

93. MOTH: Fam. Geometridae
2 larvae on stem; 1 adult in flight.
PLANT: Fam. Mimosaceae *Desmanthus virgatus* (L.) Willd. (Ground Tamarind)
Stem, leaves and seed pods. No larval damage.
ANNOTATIONS: *r* [ink] 'Caterpillar fastened itself up in leaf 21st June. Moth emerged on board the Alleghany 4th July. 96.'
SIZE: 352 × 249 mm

94. MOTH: Fam. Geometridae
2 larvae on stem; 1 adult in flight.
PLANT: Fam. Papilionaceae (Fabaceae) *Aeschynomene* sp.
Stem, leaves and flowers. No larval damage.
ANNOTATIONS: *r* [link] 'Caterpillar ate its way into a cork, 6th Nov. Moth emerged 26th Nov. 1893.'; *v* [pencil] 'Eat its way into cork 6th Nov'
SIZE: 331 × 227 mm

95. MOTH: Fam. Noctuidae: Heliothinae *Heliothis virescens* Fabricius or *H. subflexa* Guenée
2 larvae on leaves; 1 pupa drawn separately; 1 adult female in flight. 1 adult at rest.
PLANT: Fam. Caesalpiniaceae *Cassia absus* L.
Stem, leaves, flowers and seed pods. No larval damage.
ANNOTATIONS: *r* [ink] 'Caterpillar buried itself 5th Dec Moth emerged 27th Dec 95'
SIZE: 350 × 250 mm
NOTES: The key character not illustrated but more likely to be *H. virescens*, which is polyphagous on flowers and seedpods.

96. MOTH: Fam. Noctuidae: Catocalinae (Ophiderinae) *Anomis* sp., possibly *A. editrix* Guenée
1 larva on stem; 1 pupa on leaf; 1 adult in flight.
PLANT: Fam. Malvaceae *Urena lobata* L. (Ballard Bush, Bur Mallow)
Stem, leaves and flower. No larval damage.
ANNOTATIONS: *r* [ink] 'Caterpillar fastened itself up. 9th August. Moth emerged 19th August 97. From Bath.' *v* [pencil] 'Fastened itself up 9th August'
SIZE: 248 × 172 mm

97. MOTH: Fam. Possibly Noctuidae
1 larva on leaf.
PLANT: Fam. Melastomataceae Possibly *Miconia laevigata* (L.) DC (Johnny Berry, White Wattle)
Stem and leaves. Shows larval damage.
ANNOTATIONS: *v* [pencil] 'Buried itself 6th Dec.'
SIZE: 300 × 235 mm

98. MOTH: Fam. Noctuidae: Catocalinae (Ophiderinae) *Melipotis famelica* Guenée
1 larva on leaf; 1 pupa drawn separately; 1 adult male in flight, 1 adult female in flight.
PLANT: Fam. Mimosaceae *Acacia tortuosa* (L.) Willd. (Wild Poponax)
Stem and leaves. No larval damage.
ANNOTATIONS: *r* [ink] 'Chrysalis formed 23d June. Moth emerged 8th July 95'; *v* [pencil] 'Chrysalis 23d June'
SIZE: 251 × 348 mm

99. MOTH: Fam. Noctuidae: Catocalinae (Ophiderinae) *Oraesia excitans* Walker
1 larva on stem, 1 larva on leaf; 1 pupa on leaf; 1 adult in flight, 1 adult at rest.
PLANT: Fam. Menispermaceae *Cissampelos pareira* L. (Pareira Brava, Velvet Leaf)
Stem, leaves and male flowers. Shows larval damage.
ANNOTATIONS: *r* [ink] 'Caterpillar spun itself up in a leaf 21st June. Moth emerged 6th July 95'; *v* [pencil] 'Spun up 21st June.'
SIZE: 349 × 252 mm

100. MOTH: [1] Fam. Hyblaeidae *Hyblaea puera* Cramer
2 larvae on leaves; 1 pupa on leaf; 1 adult male in flight
MOTH: [2] Fam. Hyblaeidae *Hyblaea puera* Cramer
1 larva on leaf; 1 adult female in flight.
PLANT: Fam. Bignoniaceae *Catalpa longissima* (Jacq.) Dum.-Cours. (French Oak, Mast Wood, Yoke Wood)
Stem, leaves and flower. No larval damage.
ANNOTATIONS: *r* [ink] 'Moth number 1 emerged of [[from]] caterpillar 1. Dec 2d 1890 Moth emerged from 2 Dec 3d'
SIZE 183 × 262 mm
NOTES: Larvae in figs 1 and 2 may indicate different species; however no information available on *puera* group from West Indies in general.

101. MOTH: Fam. Noctuidae: Amphipyrinae *Spodoptera frugiperda* J. E. Smith (Fall Armyworm)
1 larva on leaf; 1 pupa on corn head; 1 adult female in flight.
PLANT: Fam. Gramineae (Poaceae) *Zea mays* L. (Indian Corn, Maize)
Corn head and leaves. No larval damage.
ANNOTATIONS: *r* [ink] 'Chrysalis formed 14th Jan. Moth emerged 28th Jan 97'
SIZE: 351 × 248 mm
NOTES: *S. frugiperda* is a well-known pest of grasses, cereals and other crops.

102. MOTH: Fam. Noctuidae: Catocalinae (Ophiderinae) *Anomis editrix* Guenée
1 larva on stem, 1 larva on leaf; 1 pupa in cocoon on leaf; 1 adult in flight, 1 adult at rest.
PLANT: Fam. Tiliaceae *Triumfetta semitriloba* Jacq. (Bur weed)
Stem, leaves, flowers and burs. Shows larval damage.
ANNOTATIONS: *r* [ink] 'Chrysalis formed about 15th Nov. Moth emerged 4th Dec. 1892'
SIZE 300 × 235 mm

103. MOTH: Fam. Noctuidae: Acontiinae
1 larva on leaf; 1 pupa drawn separately; 1 adult in flight.
PLANT: Fam. Convolvulaceae *Merremia quinquefolia* (L.) Hallier f. (Rock Rosemary)
Stem, leaves and flower. Shows larval damage.
ANNOTATIONS: *r* [ink] 'Chrysalis formed 8th Nov. Moth emerged 21st Nov. 1893.'; *v* [pencil] 'Chrysalis 8th Nov.'
SIZE: 330 × 228 mm

104. MOTH: Fam. Possibly Noctuidae
1 larva on stem, 1 larva on leaf; 1 pupa drawn separately; 1 adult in flight.
PLANT: Fam. Solanaceae *Solanum torvum* Sw. (Gully Bean, Susumber, Turkey Berry)
Stem, leaves, flower and fruits. Shows larval damage.
ANNOTATIONS: *r* [ink] 'Caterpillar buried itself 9th May Chrysalis formed 10th Moth emerged 22d May 95.'
SIZE: 300 × 237 mm

105. MOTH: Fam. Noctuidae: Catocalinae (Ophiderinae) *Diphthera festiva* Fabricius (Hieroglyphic Moth)
2 larvae on stem; 2 pupae on stem; 1 adult in flight.
PLANT: Fam. Sterculiaceae *Waltheria indica* L. (Raichie)
Stem, leaves and inflorescences. Shows larval damage
ANNOTATIONS: *r* [ink] 'Kings House. 21st Nov. 90.'
SIZE: 294 × 197 mm.

106. MOTH: Fam. Noctuidae: Plusiinae *Pseudoplusia includens* Walker (Soybean Looper)
1 larva on leaf; 1 pupa on leaf; 1 adult in flight, 1 adult at rest.
PLANT: Fam. Amaryllidaceae *Eucharis grandiflora* Planch. & Linden (Eucharist Lily)
Leaf and flowers. Shows larval damage.
ANNOTATIONS: *r* [ink] 'Caterpillar spun itself up 11th March. Moth emerged 23d March 1894'; *v* [pencil] 'Spun up 11th March'
SIZE: 300 × 238 mm
NOTES: *P. includens* larva is polyphagous. *E. grandiflora* is cultivated and potentially naturalised, native of Colombia.

107. MOTH: Fam. Noctuidae
1 larva on leaf; 1 pupa drawn separately; 1 adult in flight.
PLANT: Fam. Solanaceae *Cestrum diurnum* L. (Wild Jasmine)
Stem, leaves, flowers and berries. Shows larval damage.
ANNOTATIONS: *r* [ink] 'Caterpillar buried itself 28th Feb. Chrysalis formed 3d March. Moth emerged 22d March. 1894.'
SIZE: 300 × 239 mm

108. MOTH: Fam. Noctuidae: Catocalinae (Ophiderinae) *Epidromia suffusa* Walker
1 larva on leaf; 1 pupa on leaf; 1 adult female in flight.
PLANT: Myrtaceae *Psidium guajava* L. (Guava)
Stem, leaves and fruit. Shows larval damage.
ANNOTATIONS: *r* [ink] 'Chrysalis formed 23d August. Moth emerged 11th Sept. 1893.'
SIZE: 306 × 242 mm

109. MOTH: Fam. Possibly Geometridae
1 larva on leaf; 1 pupa drawn separately; 1 adult in flight.
PLANT: Fam. Oleaceae *Jasminum grandiflorum* L. (Poet's Jasmine)
Stem, leaves and flowers. No larval damage.
ANNOTATIONS: *r* [ink] 'Chrysalis formed 7th May Moth emerged 18th May 96'
SIZE: 238 × 299 mm

110. MOTH: Fam. Geometridae: Ennominae *Oxydia* sp.
2 larvae on stems; 1 pupa on leaf; 1 adult in flight.
PLANT: Fam. Rosaceae *Rosa* sp. (Rose (cultivated))
Stem, leaves and flowers. No larval damage.
ANNOTATIONS: *r* [ink] 'Caterpill[ar] fastened itself up in leaves 11th May Moth emerged 28th May 1896.'
SIZE: 350 × 250 mm

111. MOTH: [1] Fam. Geometridae: Ennominae *Oxydia* sp.
1 larva on leaf; 1 pupa on leaf; 1 adult in flight.
MOTH: [2] Unidentified
1 larva on leaf; 1 pupa on leaf; 1 adult in flight.

PLANT: Fam. Myrtaceae *Psidium guajava* L. (Guava)
Stem and leaves. Shows larval damage.
ANNOTATIONS: *r* [ink] '1 Caterpillar began to turn 28th May Moth emerged 14th June. 96'; '2 Caterpillar began to turn 5th June. Moth emerged 19th June 1896'.
SIZE: 351 × 248 mm

112. MOTH: Fam. Noctuidae: Catocalinae (Ophiderinae) *Anomis editrix* Guenée.
1 larva on leaf; 1 pupa on leaf; 1 adult in flight.
PLANT: Fam. Tiliaceae *Triumfetta* sp.
Stem and leaves. Shows larval damage.
ANNOTATIONS: *r* [ink] 'Chrysalis formed 3d Oct. Moth emerged 12th Oct 1893.'
SIZE: 301 × 236 mm

113. MOTH [1] Fam. Noctuidae: Catocalinae
1 larva on leaf; 1 pupa on leaf; 1 adult in flight.
MOTH: [2] Fam. Noctuidae: Catocalinae
1 larva on stem; 1 adult in flight
PLANT; [1] Fam. Compositae (Asteraceae) *Synedrella nodiflora* (L.) Gaertn. (Fatten Barrow)
Stem, leaves and flowers. Shows larval damage.
PLANT: [2] Fam. Gramineae (Poaceae) *Paspalum* sp.
Leaves. No larval damage.
ANNOTATIONS: *r* [ink] '1 Chrysalis formed 31st Jan. Moth emerged 13th Feb. 94'; '2 Caterpillar enclosed itself in leaf 26th Jan. Moth emerged 16th Feb. 1894'; *v* [pencil] 'Chrysalis 31st Jan'
SIZE: 307 × 243 mm

114. MOTH: Fam. Noctuidae: Catocalinae *Mocis* sp.
3 larvae on leaves; 1 pupa in leaves; 1 adult male in flight, 1 adult female in flight.
PLANT: Fam. Gramineae (Poaceae)
Leaves. No larval damage.
ANNOTATIONS: *r* [ink] 'Chrysalis of light coloured caterpillar formed 4th or 5th Nov. Moth emerged 24th Nov. 92'
SIZE: 300 × 235 mm

115. MOTH: Fam. Noctuidae: Catocalinae (Rivulinae) Probably *Rivula* sp.
1 larva on leaf; 1 pupa on leaf; 1 adult in flight.
PLANT: Fam. Gramineae (Poaceae) *Lasiacis* sp.
Stem and leaves. Shows larval damage.
ANNOTATIONS: *r* [ink] 'Chrysalis formed 23d Oct. Moth emerged 31st Oct 1893.'; *v* [pencil] 'Chrysalis formed 23d Oct'
SIZE: 301 × 236 mm

116. MOTH: Fam. Noctuidae: Hadeninae *Mythimna* sp.
2 larvae on leaves; 1 pupa drawn separately; 1 adult male in flight.
PLANT: Fam. Gramineae (Poaceae)
Leaves. No larval damage.
ANNOTATIONS *r* [ink] 'Chrysalis formed 20th Jan. Moth emerged 8th Feb. 1894'; *v* [pencil] 'Chrysalis 20th Jan'
SIZE: 300 × 238 mm

117. MOTH: [1] Fam. Noctuidae: Catocalinae (Ophiderinae) Possibly *Gonodonta clotilda* Stoll
1 larva on leaf; 1 pupa on stem; 1 adult male in flight; 1 adult female in flight.
MOTH: [2] Fam. Noctuidae: Catocalinae (Ophiderinae) *Gonodonta nutrix* Stoll
1 larva on leaf; 2 pupae drawn separately; 1 adult in flight.
PLANT: Unidentified
Stem and leaves. Shows larval damage.
ANNOTATIONS: *r* [ink] '1 Chrysalis formed 2d August. Moth emerged 22d August. 93'.; '2 Chrysalis formed 14th August. 2 Moth emerged 29th August 93.'; *v* [pencil] 'Blue chrysalis formed 14th August.'
SIZE: 300 × 236 mm

NOTES: *G. nutrix* is a pest of citrus crops (Rutaceae) in Mexico, Cuba and elsewhere (Florida – Paraguay). *G. clotilda* is also found on citrus. Several species look like this but the painting is not precise enough to distinguish them.

118. MOTH: [1] Fam. Pyralidae: Pyraustinae *Pilocrocis ramentalis* Lederer
1 larva on leaf; 1 adult in flight.
MOTH: [2] Fam. Noctuidae: Hypeninae
1 larva on leaf; 1 pupa drawn separately; 2 adults in flight.
PLANT: Fam. Possibly Acanthaceae *Justicia* sp. or *Blechum* sp.
Stem and leaves. Shows larval damage.
ANNOTATIONS: *r* [ink] '1 Chrysalis formed 19th Nov. Moth emerged 1st Dec. 1893'; 'Chrysalis formed 20th Nov. Moth emerged 2d Dec. 1893'; '1. Botys agavealis. Walker'
SIZE: 229 × 238 mm

119. MOTH: Fam. Noctuidae: Amphipyrinae *Callopistria floridensis* Guenée.
1 larva on leaf; 1 pupa drawn separately; 1 adult male in flight
PLANT: Fam. Blechnaceae *Blechnum* sp.
1 leaf. No larval damage.
ANNOTATIONS: *r* [ink] 'Caterpillar spun itself up in cocoon 4th August. Moth emerged. 17th August. 97'
SIZE: 308 × 215 mm
NOTES: *C. floridensis* is a well-known pest of ferns in glasshouses.

120. MOTH: Fam. Pyralidae: Pyraustinae *Achyra similalis* Guenée
1 larva on stem; 1 pupa in cocoon on stem; 1 adult female in flight.
PLANT: Fam. Leguminosae Possibly *Tephrosia* sp.
Stem and leaves. No larval damage.
ANNOTATIONS: *r* [ink] 'Chrysalis formed 29th Sept. Moth emerged 11th Oct. 93.'; *v* [pencil] 'Chrysalis 29th Sept'
SIZE: 300 × 236 mm

121. MOTH: Fam. Possibly Noctuidae
1 larva on stem; 1 pupa on leaf; 1 adult in flight, 1 adult at rest.
PLANT: Fam. Papilionaceae (Fabaceae) *Macroptilium lathyroides* (L.) Urb.
Stem, leaves, flower and immature pods. No larval damage.
ANNOTATIONS: *r* [ink] 'Chrysalis formed 18th August. Moth emerged 30th August. 95.'; *v* [pencil] 'Chrysalis 18th August'
SIZE: 349 × 252 mm

122. MOTH: Fam. Noctuidae: Acontiinae *Bagisara repanda* Fabricius
1 larva on leaf; 1 pupa drawn separately; 1 adult in flight.
PLANT: Fam. Malvaceae *Sida aggregata* C. Presl
Stem, leaves and flower. No larval damage.
ANNOTATIONS: *r* [ink] 'Caterpillar spun itself up 8th Nov. Moth emerged 24th. Nov. 1893.'; *v* [pencil] 'Caterpillar spun 8th Nov.'
SIZE: 300 × 238 mm

123. MOTH: Fam. Possibly Noctuidae
1 larva on leaf; 1 pupa on stem; 1 adult in flight.
PLANT: Fam. Verbenaceae *Priva lappulacea* (L.) Pers. (Clammy Bur, Fasten-'pon-coat, Styptic Bur, Velvet Bur)
Stem, leaves and burs. Shows larval damage.
ANNOTATIONS: *r* [ink] 'Chrysalis formed 25th Sept Moth emerged 6th Oct 1893.'; *v* [pencil] 'Chrysalis 25th Sept'
SIZE: 370 × 242 mm

124. MOTH: Fam. Sphingidae: Macroglossinae Probably *Xylophanes* sp.
2 larvae.
PLANT: No plant figured
SIZE: 422 × 240 mm

125. MOTH: [1] Fam. Sphingidae: Sphinginae Possibly *Manduca quinquemaculata* Haworth (Tomato Hornworm) or *M. sexta* L.
1 larva.
LEPIDOPTERA: [2] Unfinished sketch of unidentified larva.
PLANT: No plant figured
SIZE: 455 × 232 mm

126. MOTH: Sphingidae: Macroglossinae *Eumorpha labruscae* L. (Gaudy Sphinx)
1 larva.
PLANT: No plant figured
SIZE: 449 × 240 mm

127. MOTH: Sphingidae: Macroglossinae *Erinnyis ello* L.
2 larvae on stem; 1 pupa drawn separately; 1 adult female in flight.
PLANT: Fam. Probably Euphorbiaceae *Hevea brasiliensis* (Kunth) Mull. Arg. or possibly Capparaceae *Crateva* sp.
Stem and leaves. No larval damage.
ANNOTATIONS: *r* [ink] 'Chrysalis formed at King's House 2nd April. Moth emerged in London 7th May 1894'
SIZE: 331 × 456 mm
NOTES: Foodplant of *E. ello* recorded in literature as *Poinsettia* sp., etc. (Euphorbiaceae) and *Psidium guajava* L. (Myrtaceae).

128. MOTH: Fam. Sphingidae: Macroglossinae *Enyo lugubris latipennis* Rothschild & Jordan
4 larvae on tendril; 1 pupa drawn separately; 1 adult (probably female) in flight.
PLANT: Fam. Vitaceae Possibly *Cissus sicyoides* L. (= *C.verticillata* (L.) Nicolson & Jarvis) (Pudding Withe, Snake Withe)
Stem, leaves and tendrils. Shows larval damage.
ANNOTATIONS: *r* [ink] 'Caterpillar buried itself 27th March King's House. Moth emerged in London, 10th May 1894'; *v* [ink] 'Two caterpillars buried themselves 27th & 28th March'; *v* [pencil] 'Brown c[aterpillar] buried itself 9th Feb'
SIZE: 456 × 330 mm
NOTES: Foodplants of *E. lugubris latipennis* recorded in literature as *Cissus* sp., *Vitis* sp., *Ampelopsis* sp. (Vitaceae).

129. MOTH: Fam. Sphingidae: Macroglossinae *Pachylia ficus* L.
1 larva on stem; 1 pupa drawn separately; 1 adult male in flight.
PLANT: Fam. Moraceae *Ficus* sp.
Stem and leaves. No larval damage.
ANNOTATIONS: *r* [ink] 'Caterpillar spun itself up 4th Jan. Moth emerged 9th Feb. 96.'
SIZE: 456 × 331 mm
NOTES: Foodplant of *P. ficus* recorded in literature as *Ficus* sp. The larva is shown coloured red which is the colour it turns prior to pupation.

130. MOTH: Fam. Sphingidae: Macroglossinae *Erinnyis alope* Drury
1 larva on leaf; 1 pupa drawn separately; 1 adult in flight.
PLANT: Fam. Possibly Malvaceae *Hibiscus* sp.
1 leaf. Shows larval damage.
ANNOTATIONS: *r* [ink] 'Caterpillar retired under moss 31st Oct Chrysalis formed 2d Nov. Moth emerged 22d Nov. 1893.'; *v* [pencil] 'Caterpillar buried itself 31st Oct. Chrysalis formed 2d Nov.
SIZE: 456 × 331 mm
NOTES: Foodplant of *E. alope* recorded in literature as *Carica papaya* L. (Caricaceae), *Jatropha* sp. (Euphorbiaceae), *Allamanda* sp. (Apocynaceae).

131. MOTH: Fam. Sphingidae: Macroglossinae *Eumorpha labruscae* L. (Gaudy Sphinx)
1 larva on ground; 1 pupa drawn separately; 1 adult in flight.
PLANT: Fam. Solanaceae *Lycopersicon esculentum* Mill. (Tomato)
Stem, leaves, flowers and fruits. No larval damage.
ANNOTATIONS: *r* [ink] 'Craigton. 30th Oct 90. Caterpillar buried itself 31st Oct Moth emerged 7th Dec. 1890'

SIZE: 501 × 355 mm
NOTES: Foodplants of *E. labruscae* recorded in literature as *Cissus* sp., *Vitis* sp. (Vitaceae), and *Eupatorium* sp. (Compositae (Asteraceae)). *L. esculentum* is *not* the larval foodplant.

132. MOTH: Fam. Sphingidae: Macroglossinae *Xylophanes tersa* L.
1 larva on stem; 1 pupa drawn separately; 1 adult in flight.
PLANT: Fam. Vitaceae *Vitis vinifera* L. (European or Wine Grape (cultivated))
Stem and leaves. No larval damage.
ANNOTATIONS: *r* [ink] 'Caterpillar spun itself up 26th Dec 95 Moth emerged 23d Jan 96'
SIZE: 251 × 350 mm
NOTES: Foodplants of *X. tersa* recorded in literature as *Spermacoce* sp., *Pentas* sp., and *Manettia* sp. (Rubiaceae). *Vitis* unusual but not impossible. Larva figured is the less common green form.

133. MOTH: [1 & 2] Fam. Sphingidae: Macroglossinae *Eumorpha fasciatus* Sulzer
4 larvae on stem; 1 pupa drawn separately; 2 adults in flight.
PLANT: Fam. Onagraceae *Ludwigia octovalvis* (Jacq.) Raven
Stem, leaves and flowers. Shows larval damage.
ANNOTATIONS: *r* [ink] '1 Caterpillar buried itself 8th Sept Moth emerged 30th Sept 95'; '2 Caterpillar buried itself 10th Sept Moth emerged 30th Sept 95'
SIZE: 457 × 331 mm
NOTES: Foodplant of *E. fasciata* recorded in literature as in Onagraceae.

134. MOTH: Fam. Sphingidae: Macroglossinae *Pseudosphinx tetrio* L. (Frangipani Sphinx)
1 larva on stem, 1 larva on leaf; 1 pupa drawn separately; 1 adult in flight.
PLANT: Fam. Apocynaceae *Plumeria rubra* L. (Frangipani)
Stem, leaves and flowers. Shows larval damage.
ANNOTATIONS: *r* [ink] 'Chrysalis formed 15th June. Moth emerged 8th July. 1893.'; 'King's House 8th June. 1893'
SIZE: 331 × 456 mm
NOTES: Foodplants of *P. tetrio* recorded in literature as *P. rubra* and *Jasminum* sp. (Oleaceae).

135. MOTH: Fam. Sphingidae: Macroglossinae *Xylophanes* sp.
1 parasitised larva attached to twig.
PLANT: Twig and grass.
ANNOTATIONS: *v* [pencil] '240 Chrysalidae in nest'
SIZE: 136 × 150 mm
NOTES: Larva shown parasitised by Braconidae, possibly *Apanteles* sp. (Hymenoptera).

136. MOTH: Fam. Sphingidae: Macroglossinae Probably *Erinnyis ello* L.
2 larvae.
PLANT: No plant figured
SIZE: 300 × 236 mm

137. MOTH: Fam. Sphingidae: Sphinginae *Protambulyx strigilis* L.
1 larva on stem; 1 pupa drawn separately; 1 adult in flight.
PLANT: Fam. Anacardiaceae *Spondias purpurea* L. (Jamaican Plum)
Stem and leaves. No larval damage.
ANNOTATIONS: *r* [ink] 'Chrysalis formed 9th Dec 92. Moth emerged 1st Jan. 93.'
SIZE: 300 × 235 mm
NOTES: Foodplants of *P. strigilis* recorded in literature as all Anacardiaceae including *Spondias* sp. *S. purpurea* introduced from the South Pacific.

138. MOTH: Fam. Sphingidae: Sphinginae *Cocytius antaeus antaeus* Drury (Giant Sphinx)
1 larva on stem; 1 pupa drawn separately; 1 adult female in flight.
PLANT: Fam. Annonaceae
Stem and leaves. Shows larval damage.
ANNOTATIONS: *r* [ink] 'Caterpillar buried itself 8th Nov. Chrysalis formed 14th Nov. Moth emerged 20th Dec. 92.'

No. 138 *Cotvus antaeus antaeus* Drury (moth), Annonaceae (plant)

SIZE: 300 × 235 mm.
NOTES: Foodplant of *C. antaeus antaeus* recorded in literature as *Annona* sp. (Annonaceae).

139 MOTH: Fam. Sphingidae: Sphinginae *Manduca quinquemaculata* Haworth (Tomato Hornworm)
1 larva on leaf; 1 pupa drawn separately; 1 adult female in flight.
PLANT: Unidentified
1 lanceolate leaf. Shows larval damage.
ANNOTATIONS: *r* [ink] 'Moth emerged on board the Para 10th June 1891'
SIZE: 355 × 214 mm

NOTES: Foodplants of *M. quinquemaculata* recorded in literature include *Solanum tuberosum* L. and *Lycopersicon esculentum* Mill. (Solanaceae)

140. MOTH: Fam. Sphingidae: Macroglossinae *Erinnyis ello* L.
1 larva on stem; 1 pupa drawn separately; 1 adult male in flight.
PLANT: Fam. Euphorbiaceae *Manihot esculenta* Crantz (Cassava, Tapioca)
Stem and leaves. Shows larval damage.
ANNOTATIONS: *r* [ink] 'From Pedro Plain.'; 'Chrysalis formed 13th Jan. Moth emerged 5th Feb 97'
SIZE: 253 × 354 mm

141. MOTH: Fam. Sphingidae: Macroglossinae Probably *Eumorpha labruscae* L. (Gaudy Sphinx)
1 parasitised larva on stem.
PLANT: Fam. Vitaceae *Cissus sicyoides* L. (= *C. verticillata* (L.) Nicolson & Jarvis) (Pudding Withe, Snake Withe)
Stem, leaves, and flower buds. No larval damage.
ANNOTATIONS: *r* [ink] 'Ichnoumon chrysalidae formed 4th August 97. Till that day the caterpillar had seemed quite healthy. Flies emerged 9th August.'; *v* [pencil] 'Ichnoumon chrysalidae formed on caterpillar 4th August 97. Till that day the caterpillar had seemed quite healthy'
SIZE: 238 × 130 mm
NOTES: Larva parasitised by Braconidae, probably *Apanteles* sp. (Hymenoptera).

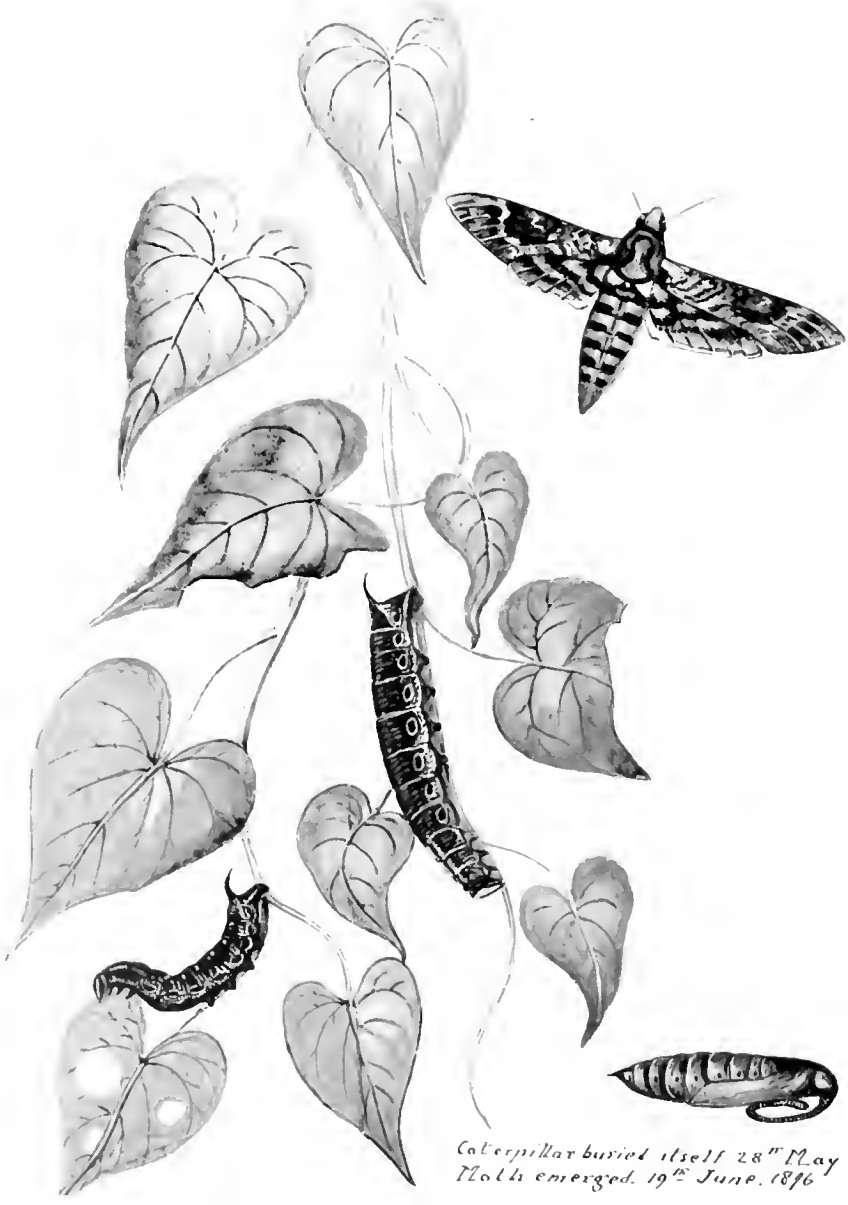
142. MOTH: Fam. Sphingidae: Macroglossinae *Eumorpha satellitia satellitia* L.
1 larva on stem; 1 pupa drawn separately; 1 adult in flight.
PLANT: Fam. Vitaceae *Vitis vinifera* L. (European or Wine Grape (cultivated))
Stem and leaves. Shows larval damage.
SIZE: 356 × 255 mm
NOTES: Foodplant of *E. satellitia licaon* Cramer recorded in literature as *Cissus* sp. (Vitaceae) in Brazil.

143. MOTH: Fam. Sphingidae: Sphinginae *Manduca rustica rustica* Fabricius (Rustic Sphinx)
1 larva on stem, 1 larva on leaf.
PLANT: Fam. Boraginaceae *Cordia brownei* (Friesen) I. M. Johnston or *C. jamaicensis* I. M. Johnston
Stem, leaves and flowers. Shows larval damage.
SIZE: 352 × 247 mm
NOTES: Foodplants of *M. rustica rustica* recorded in literature as in Verbenaceae and Boraginaceae.

144. MOTH: Sphingidae: Macroglossinae *Pachylia ficus* L.
2 larvae on stem; 1 pupa drawn separately.
PLANT: Fam. Possibly Moraceae *Ficus* sp.
Stem, leaves and fruit. Shows larval damage.
ANNOTATIONS: *r* [ink] 'Began to turn 14th June. Moth emerged on board the Alleghany 3d July 96'
SIZE: 351 × 248 mm
NOTES: The larva is shown the colour it turns just prior to pupation.

145. MOTH: Fam. Sphingidae: Macroglossinae *Eumorpha fasciatus* Sulzer
2 larvae on stem; 1 pupa drawn separately; 1 adult female in flight.
PLANT: Fam. Onagraceae *Ludwigia octovalvis* (Jacq.) Raven
Stem, leaves and flowers. No larval damage.
ANNOTATIONS: *r* [ink] 'Caterpillar began to turn 19th April.'; 'Moth emerged 11th May 96'; *v* [pencil] 'began to turn April 96. Caterpillar [[buried itself 6th Sept]]'
SIZE: 349 × 251 mm

146. MOTH: Fam. Sphingidae: Sphinginae *Agrius cingulata* Fabricius (Sweet Potato Hornworm)
2 larvae on stem; 1 pupa drawn separately; 1 adult female in flight.
PLANT: Fam. Convolvulaceae *Ipomoea* sp.



No. 146 *Agrius cingulata* Fabricius (moth), *Ipomoea* sp. (plant)

Stem and leaves. Shows larval damage.
ANNOTATIONS: *r* [ink] 'Caterpillar buried itself 28th May Moth emerged 19th June. 1896'; *r* [pencil] 'Caterpillar buried itself 13th August'; 'In an earlier stage this caterpillar is green'
SIZE: 349 × 250 mm
NOTES: Foodplant of *A. cingulata* recorded in literature as *Ipomoea batatas* (L.) Lam. (Sweet Potato). Bottom left corner redrawn on paper which has been pasted over the original image.

147. MOTH: Fam. Sphingidae: Sphinginae Probably *Manduca* sp.
1 larva on stem.
PLANT: Fam. Possibly Solanaceae *Capsicum* sp.

No. 149 *Erinnyis ello* L. (moth), *Euphorbia hirta* L. (plant)

Unfinished sketch of stem and leaves.
SIZE: 300 × 236 mm

148. MOTH: Fam. Sphingidae: Sphinginae *Manduca rustica rustica* Fabricius (Rustic Sphinx)
1 larva on stem; 1 pupa drawn separately; 1 adult male in flight.
PLANT: Unidentified
Stem and leaves. Shows larval damage.
ANNOTATIONS: *r* [ink] 'Caterpillar buried itself 7th June. Moth emerged 12th July 1893.'; *v* [pencil] 'Caterpillar buried itself 7th June'
SIZE: 300 × 235 mm
NOTES: Foodplants of *M. rustica rustica* recorded in literature as in Verbenaceae and Boraginaceae.

149. MOTH: Fam. Sphingidae: Macroglossinae *Erinnyis ello* L.
1 larva on stem; 1 pupa drawn separately; 1 adult female in flight.
PLANT: Fam. Euphorbiaceae *Euphorbia hirta* L.
Stem, leaves and flowers. No larval damage.
ANNOTATIONS: *r* [ink] 'Chrysalis formed 23d Jan. Moth emerged 20th Feb 1894'
SIZE: 300 × 238 mm

150. MOTH: Fam. Sphingidae: Macroglossinae *Xylophanes tersa* L.
2 larvae on stems, 1 larva on leaf; 1 pupa suspended from leaves; 1 adult in flight.
PLANT: Fam. Rubiaceae *Borreria laevis* (Lam.) Griseb. (= *Spermacoce assurgens* Ruiz & Pavon) (Button Weed)
Stem and leaves. Shows larval damage.
ANNOTATIONS: *r* [ink] 'Chrysalis formed 7th Oct. Moth emerged 29th Oct 1893.'; *v* [pencil] 'Spun 7th Oct'
SIZE: 301 × 237 mm
NOTES: Common brown form of larva figured.

151. MOTH: Fam. Sphingidae: Macroglossinae *Hyles lineata* Fabricius (White-lined Sphinx)
1 larva on stem; 1 pupa drawn separately; 1 adult in flight.
PLANT: Fam. Nyctaginaceae *Boerhavia erecta* L.
Stem, leaves and flowers. No larval damage.
ANNOTATIONS: *r* [ink] 'Chrysalis formed 5th Nov. Moth emerged 1st Dec. 92.'
SIZE: 300 × 235 mm
NOTES: *H. lineata* larva is polyphagous.

152. MOTH: Unidentified
1 larva on stem; 1 pupa on leaf; 1 adult in flight, 1 adult at rest on leaf.
PLANT: Fam. Meliaceae *Trichilia hirta* L. (Wild Mahogany)
Stem and leaves. Shows larval damage.
ANNOTATIONS: *r* [ink] 'Chrysalis formed 25th Feb. Moth emerged 5th March. 94.'; *v* [pencil] 'Caterpillar rolled itself up 23d Feb Chrysalis 25th. Feb'
SIZE: 330 × 456 mm.
NOTES: Plant shows signs of possibly leaf mines or disease.

153. LEPIDOPTERA: Unidentified
2 larvae on leaves.
PLANT: Fam. Gesneriaceae *Rytidophyllum tomentosum* (L.) Martius ex G. Don
Stem and leaves. Shows larval damage.
SIZE: 350 × 250 mm

154. MOTH: Fam. Possibly Geometridae: Geometrinae
3 larvae on stem, 2 larvae suspended from stem; 1 pupa drawn separately; 1 adult in flight.
PLANT: Fam. Possibly Caesalpiniaceae *Parkinsonia aculeata* L.
Stem and leaves. Shows larval damage.
ANNOTATIONS: *r* [ink] 'Chrysalis formed 28th June. Moth emerged 5th July 97.'; Spanish Town.'
SIZE: 249 × 352 mm

No. 151 *Hyles lineata* Fabricius (moth), *Boerhavia erecta* L. (plant)

155. MOTH: Fam. Geometridae: Geometrinae
2 larvae on leaves; 1 pupa on stem; 1 adult in flight.
PLANT: Fam. Possibly Rosaceae *Prunus* sp.
Stem and leaves. No larval damage.
ANNOTATIONS: *r* [ink] 'Caterpillar fastened itself up 22d May. Moth emerged 2d June. 96'
SIZE: 250 × 256 mm

156. MOTH: Fam. Geometridae: Geometrinae
1 larva on flower; 1 pupa on stem; 1 adult in flight.
PLANT: Fam. Anacardiaceae *Mangifera indica* L. (Mango)
Stem, leaves and flowers. No larval damage.
ANNOTATIONS: *r* [ink] 'Chrysalis formed 20th Feb. Moth emerged 28th Feb. 95'
SIZE: 255 × 356 mm
NOTES: *M. indica* is introduced in Jamaica.

157. MOTH: Fam. Geometridae: Ennominae *Melanochroia* sp., possibly *M. chephise* Stoll
2 larvae on leaves, 2 larvae on stems; 1 pupa drawn separately; 2 adults in flight.
PLANT: Fam. Euphorbiaceae *Phyllanthus acidus* (L.) Skeels (Cheramina, Jimbling, Otaheite Gooseberry, Short Jimbelin)
Stem, leaves, flowers and fruit. Shows larval damage.
ANNOTATIONS: *r* [ink] 'Chrysalis formed 8th Feb. Moth emerged 21st Feb. 1893'
SIZE: 242 × 307 mm

158. MOTH: Fam. Sphingidae: Macroglossinae *Eumorpha fasciatus* Sulzer
2 larvae.
PLANT: No plant figured
SIZE: 300 × 236 mm

159. MOTH: [1] Fam. Possibly Noctuidae
1 larva on leaf.
MOTH: [2] Fam. Saturniidae
1 larva on leaf.
PLANT: Fam. Myrtaceae *Psidium guajava* L. (Guava)
Stem and leaves. Shows larval damage.
ANNOTATIONS: *r* [ink] 'Chrysalis formed 9th Sept'
SIZE: 306 × 242 mm

160. MOTH: Fam. Possibly Epiplemidae
3 larvae on leaves; 2 pupae on leaf; 2 adults in flight.
PLANT: Fam. Verbenaceae *Stachytarpheta mutabilis* (Jacq.) Vahl
Stem, leaves and flowers. Shows larval damage.
ANNOTATIONS: *r* [ink] 'Chrysalis formed 11th August. Moth emerged 19th August, 1893.'
SIZE: 383 × 237 mm

161. MOTH: Fam. Psychidae *Oiketicus* sp.
2 larvae on leaf.
PLANT: Fam. Caesalpiniaceae *Delonix regia* (Boj. ex Hook.) Raf. (Flamboyant, Poinciana)
Stem and leaves. No larval damage.
SIZE: 350 × 249 mm
NOTES: *D. regia* is an introduced ornamental from Madagascar.

162. MOTH: Fam. Psychidae *Oiketicus* sp.
2 larvae on leaves.
PLANT: Fam. Combretaceae *Terminalia catappa* L. (West Indian Almond)
Stem, leaves and flowers. Shows larval damage.
SIZE: 314 × 453 mm
NOTES: Larvae are shown feeding from their characteristic larval cases.

163. MOTH: Fam. Pyralidae: Pyraustinae Probably *Mesocondyla concordalis* Hübner
1 larva on leaf; 1 pupa on leaf; 1 adult male in flight.
PLANT: Fam. Bignoniaceae *Crescentia cujete* L. (Calabash Tree)

No 160 Epiplemidae (moth), *Stachytarpheta mutabilis* (Jacq) Vahl (plant)

Stem and leaves. Shows larval damage.
ANNOTATIONS: *r* [ink] 'Chrysalis formed about 18th Nov. Moth emerged 30th Nov. 1893'; *v* [pencil] 'Spun up about 18th Nov'
SIZE: 508 × 237 mm

164. MOTH: Fam. Lasiocampidae *Titya* sp.
2 larval nests suspended from stems; 7 larvae on leaves, stem and outside of larval nest; 1 cocoon on stem; 2 adult females in flight, 1 adult female at rest.
PLANT: Fam. Rosaceae *Prunus myrtifolia* (L.) Urb. (Ant's Wood, Wild Cassada)
Stems, leaves and flowers. Shows larval damage.

No. 164 *Titya* sp. (moth); *Prunus myrtifolia* (L.) Urb. (plant)

ANNOTATIONS: *r* [ink] 'On the night of April 13th the caterpillars fed, after this they retired permanently into their purse-like nest, in which they assumed the chrysalis stage, Moth emerged 15th May 95.'
SIZE 456 × 330 mm

165. MOTH: [1] Fam. Limacodidae *Alarodia nana* Möschler
4 larvae on stems and leaves; 6 pupae on stems; 2 adults in flight, 3 adults at rest.
MOTH: [2] Unidentified
1 adult in flight, 1 adult at rest.
PLANT: Fam. Anacardiaceae *Spondias* sp.
Stem and leaves. Shows larval damage.
ANNOTATIONS: *r* [ink] 'Chrysalis formed 16th July Moth emerged 1st August 1893'
SIZE: 456 × 330 mm

166. MOTH: [1] Fam. Pyralidae: Pyraustinae Probably *Epicorsia* sp. near *oedipodalis* Guenée and *cerata* Fabricius
1 pupa (cocoon) on leaf; 2 adult males in flight.
MOTH: [2] Unidentified
2 larvae on leaves.
PLANT: Fam. Possibly Rubiaceae or Acanthaceae
ANNOTATIONS: *r* [ink] 'Cocoon spun 23d Nov. Moth emerged 9th Dec. 1893'; *v* [pencil] 'Chrysalis formed 23d Nov'
SIZE: 457 × 331 mm

167. MOTH: Fam. Pyralidae: Pyraustinae *Mesocondyla concordalis* Hübner
2 larvae on leaf; 1 pupa on leaf; 1 adult male in flight.
PLANT: Fam. Bignoniaceae *Tabebuia rufescens* J. R. Johnston (Yellow Poui)
Stem and leaves. Shows larval damage and dipterous leaf mine.
ANNOTATIONS: *r* [ink] 'Chrysalis formed 17th Feb. Moth emerged 5th March, 94'; 'Bolys gastralis. Guenée'; *v* [pencil] 'Chrysalis 17th Feb.'
SIZE: 457 × 331 mm

168. MOTH: Fam. Psychidae *Oiketicus* sp.
2 larvae on leaf.
PLANT: Fam. Palmae (Arecaceae) Palm leaf.
SIZE: 330 × 456 mm
NOTES: The drawing shows the portable larval cases of a pair of *Oiketicus*. In one the larva is retracted and in the other the larva is protruded and feeding.

169. MOTH: Fam. Pyralidae: Phycitinae Probably *Elasmopalpus lignosella* Zeller
1 larva on pod; 1 pupa on pod; 1 adult male in flight.
PLANT: Fam. Papilionaceae (Fabaceae) *Cajanus cajan* (L.) Millsp. (Gungo Pea, Pigeon Pea)
Stem, leaves, flowers and pods. No larval damage.
ANNOTATIONS: *r* [ink] 'Caterpillar fastened itself up 19th Feb. Moth emerged 9th March 97'
SIZE: 351 × 248 mm
NOTES: Plant is unfinished sketch.

170. MOTH: Fam. Pyralidae: Pyraustinae *Conchylodes diphteralis* Geyer
2 larvae on leaf; 1 adult male in flight.
PLANT: Fam. Possibly Boraginaceae *Cordia gerascanthus* L. (Juvenile)
Stem and leaves. Shows larval damage and pest damage (possibly mites).
ANNOTATIONS: *r* [ink] 'Caterpillar fastened itself up in leaf 3d March. King's House. Moth emerged in London 10th May 1894'; *v* [pencil] 'Fastened up leaves 3d March'
SIZE: 238 × 301 mm

171. MOTH: Fam. Pyralidae: Pyraustinae *Syngamia haemorrhoidalis* Guenée
1 larva on leaf; 1 pupa on leaf; 1 adult male in flight.
PLANT: Fam. Papilionaceae (Fabaceae) *Teramnus uncinatus* (L.) Sw.
Stem and leaves. Shows larval damage.

ANNOTATIONS: *r* [ink] 'Chrysalis formed 28th August. Moth emerged 7th Sept 1893.'
SIZE: 307 × 242 mm

172. MOTH: Fam. Pyralidae: Pyraustinae *Diaphania hyalinata* L.
2 larvae on leaf; 1 pupa on leaf; 1 adult male in flight.
PLANT: Fam. Cucurbitaceae
1 leaf. Shows larval damage.
ANNOTATIONS: *r* [ink] 'Chrysalis formed 2d Jan 93. Moth emerged 14th Jan.'
SIZE: 300 × 236 mm

173. MOTH: Fam. Pyralidae: Pyraustinae *Hoterodes ausonia* Cramer
1 larva on leaf; 1 pupa on leaf; 1 adult male in flight.
PLANT: Fam. Burseraceae *Bursera simaruba* (L.) Sarg. (Red Birch)
Stem and leaves. No larval damage.
ANNOTATIONS: *r* [ink] 'Chrysalis formed 1st June. Moth emerged about 11th June 97.'
SIZE: 249 × 352 mm

174. MOTH: Fam. Probably Pyralidae: Pyraustinae
2 larvae on leaf; 1 pupa on leaf; 1 adult male in flight.
PLANT: Fam. Possibly Asclepiadaceae
Stem and leaves. Shows larval damage.
ANNOTATIONS: *r* [ink] 'Chrysalis formed 28th Feb. Moth emerged 11th March 97'
SIZE: 350 × 248 mm

175. MOTH: Fam. Pyralidae: Pyraustinae *Syllepte* sp., possibly *S. prorogata* Hampson
3 larvae on leaves; 1 pupa on leaf; 2 adult males in flight.
PLANT: Unidentified
Large alternate leaves. Shows larval damage.
ANNOTATIONS: *r* [ink] 'Chrysalis formed 19th Dec. Moth emerged 29th Dec. 1894'; *v* [pencil] 'Chrysalis formed 19th Dec'
SIZE: 255 × 355 mm

176. MOTH: Fam. Pyralidae: Pyraustinae *Desmia* sp.
1 larva on leaf; 1 pupa drawn separately; 1 adult (probably female) in flight.
PLANT: Fam. Myrtaceae *Psidium guajava* L. (Guava)
Stem and leaves. Shows larval damage.
ANNOTATIONS: *r* [ink] 'Chrysalis formed 23d Dec. 96 Moth emerged 5th Jan 1897'
SIZE: 248 × 185 mm

177. MOTH: [1] Fam. Pyralidae: Pyraustinae *Syngamia florella* Cramer
1 larva on stem; 1 pupa on stem; 1 adult in flight.
MOTH: [2] Unidentified.
2 larvae on leaf.
PLANT: Fam. Possibly Rubiaceae
Stem and leaves. No larval damage.
ANNOTATIONS: *r* [ink] '1 Chrysalis formed 25th Oct. Moth emerged 4th Nov. 1893.'; *v* [pencil] 'Chrysalis formed 25 [[10th Sept.]] Oct'
SIZE: 300 × 256 mm

178. MOTH: Fam. Pyralidae: Pyraustinae Probably *Udea* sp.
1 larva on leaf; 1 pupa on leaf; 1 adult (probably male) in flight.
PLANT: Fam. Possibly Leguminosae
Stem and leaves. No larval damage.
ANNOTATIONS: *r* [ink] 'Caterpillar began to turn 29th May Moth emerged 14th June. 96'
SIZE: 351 × 248 mm

179. MOTH: Fam. Pyralidae: Nymphulinae Possibly *Argyractis* sp.
1 larva on leaf; 1 pupa on leaf; 1 adult (possibly male) in flight.
PLANT: Fam. Araceae *Pistia stratiotes* L. (Water Lettuce)
Plant floating on water. No larval damage.

ANNOTATIONS: *r* [ink] 'Chrysalis formed 22d March. Moth emerged 31st March. 95'
SIZE: 255 × 133 mm

180. MOTH: Fam. Pyralidae: Pyraustinae *Phostria humeralis* Guenée.
1 larva on leaf; 1 pupa on leaf; 2 adult males in flight.
PLANT: Fam. Mimosaceae *Inga vera* Willd. (Panchock, River Koko)
Stem and leaves. Shows larval damage.
ANNOTATIONS: *r* [ink] 'Chrysalis formed 25 Dec 96 Moth emerged 6th Jan 97'
SIZE: 351 × 248 mm

181. MOTH: Fam. Pyralidae: Pyraustinae Probably *Pilocrocis hypoleucalis* Hampson
1 larva on leaf; 1 pupa on leaf; 2 adult females in flight.
PLANT: Fam. Solanaceae *Solanum americanum* Mill. (Black Nightshade, Gouma)
Stem, leaves, flowers and fruit. No larval damage.
ANNOTATIONS: *r* [ink over pencil] 'Chrysalis formed 3d Feb. Moth emerged 18th Feb. 94.'
SIZE: 306 × 242 mm

182. MOTH: Fam. Pyralidae: Pyraustinae Possibly *Pilocrocis glaucusalis* Walker
1 larva on leaf; 1 pupa on leaf; 1 adult male in flight.
PLANT: Fam. Moraceae *Ficus citrifolia* Mill.
Stem and leaves. Shows larval damage.
ANNOTATIONS: *r* [ink] 'Chrysalis formed 10th August. Moth emerged 20th August. 1893.'
SIZE: 345 × 239 mm

183. MOTH: Fam. Pyralidae: Pyraustinae Possibly *Acrospila gastralis* Guenée
1 larva on leaf, 1 pupa on leaf; 2 adult males in flight.
PLANT: Fam. Bignoniaceae *Tecoma stans* (L.) Kunth
Stem, leaves and flowers. No larval damage.
ANNOTATIONS: *r* [ink] 'Chrysalis formed 5th Jan. Moth emerged 19th Jan.1894'; 'Batys gastralis Guenée'; *v* [pencil] 'Chrysalis 5th Jan'
SIZE: 300 × 238 mm

184. MOTH: Fam. Pyralidae: Pyraustinae Probably *Epipagis mopsalis* Walker
1 larva on leaf; 1 pupa on leaf; 1 adult female in flight.
PLANT: Fam. Melastomataceae *Miconia laevigata* (L.) DC (Johnny Berry, White Wattle)
Stem and leaves. No larval damage.
ANNOTATIONS: *r* [ink] 'Chrysalis formed 20th August. Moth emerged 6th Sept 93'
SIZE: 307 × 242 mm

185. MOTH: Fam. Pyralidae: Pyraustinae *Phostria* sp., possibly *P. fulvicauda* Hampson
39 larvae grouped together on one leaf; 7 pupae on one leaf; 3 adult males in flight.
PLANT: Fam. Caesalpiniaceae *Bauhinia* sp.
Stem and leaves. No larval damage.
ANNOTATIONS: *r* [ink] 'Chrysalis formed 28th Nov Moth emerged 12th Dec 1893'; *v* [pencil] '28th Nov'
SIZE: 306 × 242 mm
NOTES: This is possibly an undescribed species.

186. MOTH: Fam. Pyralidae: Glaphyrinae *Symphysa discalis* Hampson
3 larvae on leaf; 1 pupa on leaf; 1 adult male at rest, 1 adult male in flight.
PLANT: Fam. Capparaceae Possibly *Crateva* sp.
Stem and leaves. Shows larval damage.
ANNOTATIONS: *r* [pencil] 'L. 25th Feb.'
SIZE: 299 × 238 mm
NOTES: *S. discalis* is endemic to Jamaica.

187. MOTH: Fam. Pyralidae: Pyraustinae *Syllepte silicalis* Guenée
1 larva on leaf; 1 pupa on leaf; 2 adult males in flight.
PLANT: Fam. Probably Urticaceae
Stem and leaves. Shows larval damage.
ANNOTATIONS: *r* [ink] 'Chrysalis formed 23d Dec. 92 Moth emerged 8th Jan 93'

SIZE: 300 × 235 mm
NOTES: Specimen from Jamaica in BM(NH) feeding on *Boehmeria* sp. (Urticaceae).

188. MOTH: Fam. Pyralidae: Pyraustinae *Pilocrocis tripunctata* Fabricius
1 larva on leaf; 1 cocoon on plant; 1 adult male in flight.
PLANT: Fam. Convolvulaceae *Ipomoea* sp.
Tendril with leaves. Shows larval damage.
ANNOTATIONS: *r* [ink] 'Botys campalis = Guenée'; *v* [pencil] 'Chrysalis formed 4th Oct. Emerged 5th Nov.'
SIZE: 306 × 242 mm

189. MOTH: Fam. Pyralidae: Crambinae *Microcrambus* sp.
1 larva on stem; 1 larva on leaf; 1 pupa on leaf; 2 adults in flight.
PLANT: Fam. Papilionaceae (Fabaceae) *Indigofera subulata* Poir.
Stem, leaves and flowers. No larval damage.
ANNOTATIONS: *r* [ink] 'Chrysalis formed 2d Sept. Moth emerged 10th Sept 1893'
SIZE: 300 × 236 mm

190. MOTH: Unidentified
1 larva on leaf; 2 pupae on leaf; 1 adult in flight.
PLANT: Fam. Possibly Apocynaceae
Stem and leaves. Shows larval damage.
ANNOTATIONS: *r* [ink] 'Chrysalis formed 11th Feb. Moth emerged 21st Feb. 94.'; *v* [pencil] 'Chrysalis 11th Feb.'
SIZE: 457 × 330 mm

191. MOTH: Fam. Tortricidae *Platynota rostrana* Walker
1 larva on leaf; 1 pupa on leaf; 1 adult in flight; 1 adult at rest.
PLANT: Fam. Passifloraceae *Passiflora suberosa* L.
Stem, leaves and fruit. No larval damage.
ANNOTATIONS: *r* [ink] 'Chrysalis formed 11th Feb Moth emerged 21st Feb 94'; *v* [pencil] 'Chrysalis 11th Feb'
SIZE: 238 × 143 mm

192. MOTH: Fam. Tortricidae *Platynota rostrana* Walker
2 larvae on leaves; 2 adults in flight, 1 adult at rest.
PLANT: Fam. Anacardiaceae *Spondias mombin* L.
Stem and leaves. Shows larval damage.
ANNOTATIONS: *r* [ink] 'Chrysalis formed 4th Dec Moth emerged 13th Dec. 96'
SIZE: 149 × 354 mm

193. MOTH: Fam. Possibly Tortricidae
1 larva on leaf; 1 pupa on leaf; 1 adult in flight.
PLANT: Fam. Urticaceae *Pilea* sp.
Stem and leaves. Shows larval damage.
ANNOTATIONS: *r* [ink] 'Chrysalis formed 22d Feb. Moth emerged 2d March 97'
SIZE: 300 × 184 mm

194. MOTH: Unidentified
3 larvae on leaves; 1 pupa on leaf; 1 adult in flight.
PLANT: Fam. Labiatae (Lamiaceae) *Hyptis capitata* Jacq. (Ironwort, Wild Caesar Obeah)
1 stem with leaves; 1 dead stem with old inflorescences. Shows larval damage.
ANNOTATIONS: *r* [ink] 'Chrysalis formed 18th August Moth emerged 25th August. 1893.'
SIZE: 507 × 238 mm

195. MOTH: Fam. Pterophoridae: Pterophorinae *Pterophorus* sp.
1 larva on leaf; 1 pupa on tendril; 2 adults at rest on leaf
PLANT: Fam. Convolvulaceae *Ipomoea* sp.
Tendril and leaves. Shows larval damage.
ANNOTATIONS: *r* [ink] 'Chrysalis formed 30th April Moth developed 7th May 1896'
SIZE: 300 × 236 mm

196. MOTH: Fam. Noctuidae: Hadeninae *Faronta diffusa* Walker (Wheat Head Armyworm)
2 larvae on leaves; 1 pupa drawn separately; 1 adult at rest, 1 adult in flight.
PLANT: Fam. Gramineae (Poaceae)
Leaves. Shows larval damage.
ANNOTATIONS: *r* [ink] 'Chrysalis formed 18th Jan Moth emerged 7th Feb. 94.'; *v* [pencil] 'Chrysalis 18th Jan. emerged 7th Feb'
SIZE: 300 × 238 mm

Index of Lepidoptera Names

Numbers refer to catalogue entries. Family names are in bold, genus and species names are in italics. Catalogue numbers marked with an asterisk indicate uncertain identifications.

Index of Plant Names

Numbers refer to catalogue entries. Family names are in bold, genus and species names are in italics. Catalogue numbers marked with an asterisk indicate uncertain identifications.

Bull. Br. Mus. Nat. Hist (hist. Ser.) **18**(2): 203–228 Issued 29 November 1990

Charles Darwin's St Helena Model Notebook

Edited by GORDON RUSSELL CHANCELLOR

City Museum and Art Gallery, Priestgate, Peterborough PE1 1LF

CONTENTS

INTRODUCTION

Charles Darwin (1809–1882) is beyond question one of the most important figures in the history of science, and as each year passes our appreciation of his importance seems only to increase. At the present time students of Darwin's life and work are being treated to a definitive edition of his *Correspondence* (Burkhardt & Smith, 1985–) and there recently appeared a similarly definitive edition of his theoretical notebooks (hereinafter referred to as *Notebooks* (Barrett, Gautrey, Herbert, Kohn & Smith, 1987)).

It will take historians a long time fully to assimilate all this new material into their understanding of Darwin and the milieu in which he worked. Nevertheless, there is now a clear consensus that he became an evolutionist ('transmutationist' being the word he would have used) in the spring of 1837, within six months of his return from the voyage of the *Beagle*. It is also established that he constructed his theory of natural selection in the autumn of 1838, elaborating it and working out most of its radical implications during the winter and spring of 1839 (see *Notebooks*). Twenty years were to elapse, however, before Darwin published *On the Origin of Species* (1859), and in the intervening period few people were allowed to know the conclusion to which his work had led him. With the full publication of Darwin's *Correspondence* and *Notebooks* we can now, for the first time, trace his path to natural selection—and beyond—in as much detail as the documentary record will ever allow.

There is one small Darwin notebook, omitted for practical reasons from the *Notebooks*, which Darwin seems to have kept about his person for 'on the spot' jottings throughout the important last few months of 1838. This notebook has become known as the 'St Helena Model' notebook, because these words are written on its cover, and because it contains notes concerning a model of the island of St Helena. This notebook

Fig 1 The 'St Helena Model' notebook of Charles Darwin, open at pp. 26–7. Courtesy of the Royal College of Surgeons.

must, however, have had a greater meaning to Darwin, as it records many of his thoughts relating to variation, breeding and so on, albeit in telegraphic style. Most of these thoughts are much more fully expressed in the *Notebooks*, so that the St Helena Model notebook assumes an importance as the first medium available to a thinker who was eager not to forget the details of some observation or to lose the thread of a conversation before he could get home to his private study. Unfortunately twenty-one of the original fifty pages of the St Helena Model notebook have been excised—presumably by Darwin—and none of these excised pages has yet been found. This is all the more regretable because it was probably the theoretically most interesting pages which were excised.

In spite of its fragmentary nature the St Helena Model notebook is worthy of publication. Much remains in the notebook of interest to those studying Darwin's work as a geologist at the time when he was entering the élite of London scientists (Rudwick' 1982), but perhaps its greatest charm lies in the glimpse it gives us of the daily thoughts and activities of a young genius at the most creative period of his life. In the weeks leading up to his marriage and election to Fellowship of the Royal Society, even Charles Darwin had to think about laundry and the problems of moving into a new address: 'Two easy chairs—Blinds in Red Rooms washed—Muslin all to be washed' (p.31x).

Fig 2 The 'St Helena Model' notebook of Charles Darwin. Note the writing on the front and the orientation of the brass clasp. Courtesy of the Royal College of Surgeons.

THE NOTEBOOK

The St Helena Model notebook was briefly described and partially transcribed by Nora Barlow (Darwin's grand-daughter) in her *Charles Darwin and the Voyage of the Beagle* (1945: 255). Lady Barlow noted that Darwin had written 'Nothing' and 'St Helena Model' in bold, thick ink on the red leather cover of the notebook (see Figs 1–2), which measures approximately 7cm × 11cm and is very similar to the smallest of the pocket notebooks (referred to as 'field notebooks' in *Correspondence* 1: 545) used by Darwin during the *Beagle* voyage, with which it is now kept on display at Down House.

The surviving pages of the notebook were written almost entirely in pencil, except in a few cases where I have indicated that ink was used. So far as I can tell, none of the ink used is of the grey variety which is to be found in some of Darwin's other notebooks from this period (*Notebooks*: 14). Darwin seems almost always to have written 'down' the page, that is to say holding it with the hinge (which is 7cm long) oriented horizontally. We may imagine therefore, that the notebook was carried at all times by Darwin, ready to be jotted in whenever occasion arose; in this sense the notebook is equivalent to one of the pocket notebooks used during the *Beagle* voyage, and differs from the *Notebooks* which are essentially of post-voyage date. Evidence for dating of passages in the notebook is discussed further below; the bulk of the entries date from September to

December 1838, although there is one reference (written in ink on the inside back cover) dated 1839.

The front end paper of the notebook has the number 1.5 written in the top right hand corner, in heavy pencil, in an unknown hand; this is the notebook's Down House catalogue number (see *Correspondence* 1: 545). The front end paper is also inscribed in the bottom left hand corner, in pencil, with a number 15 in which the 5 is written over a 6. This number 15 is uniform with a series to be found in each of the other Down House notebooks which reflect the approximate chronological order in which they were used. The 'Red Notebook' (*Notebooks*: 17–81) is numbered 16 in this series, but in fact entirely predates the St Helena Model notebook. I am informed by Sandra Herbert and Peter Gautrey that this second series of numbers is in Nora Barlow's handwriting. Since neither the 1.5 nor the 15 are in Darwin's hand they are omitted from the present edition.

The pages of the notebook were not numbered by Darwin and because he wrote in it from both ends inwards, I have numbered the pages in two sequences, pp. 1–64 and pp. 1x–32x. I refer to these two sequences as the front and back of the notebook respectively, although there is no real evidence that one was started before the other. As can be seen, however, from Figures 1–2, the notebook has a hinged brass clasp similar to ones on Darwin's other surviving notebooks, in almost all of which the hinge of the clasp is on the back cover (clearly the easiest arrangement for a right-handed person). I therefore refer to that end of the St Helena Model notebook which bears the hinge of its brass clasp as the back end.

EVIDENCE FOR DATING ENTRIES IN THE NOTEBOOK

There is only one reference in the notebook as it survives today which is actually dated, and this is the 1839 reference mentioned above. All other entries in the notebook must, therefore, be dated from internal evidence and by comparison with other Darwin manuscripts which can be dated. Broadly there are three more or less distinct sections of the notebook, each of which can be dated in this way.

Firstly, the text from p. 1 to p. 15 forms a discrete essay on the geology of the island of St Helena, based on examination of a large model of the island. The evidence for dating this essay is given in more detail below, but suffice it here to say that it seems to have been written at one sitting, on or about 15 September 1838 (which was a Saturday). Just possibly this essay was written a few months before this date, following a conjectural earlier examination of the model. Darwin himself seems to have treated these first fifteen pages of the notebook as a separate entity, to judge from the pinhole through them.

Secondly, the texts from p. 16 to p. 48 and from p. 5x to p. 29x are almost entirely concerned with the many geological and biological problems that Darwin was examining in the latter months of 1838. There are numerous entries on these pages which have close parallels in the *Notebooks*, the dating of entries in which can often be stated with certainty, not least because Darwin dated many of them himself. Whilst all such parallel references to the *Notebooks* which I have found are given in the notes which follow the text, I give here the most closely datable pages against the corresponding *Notebooks* pages (in parentheses) and dates:

p. 22 (D40) between 19 and 22 August 1838
p. 41 (M142) between 13 and 15 September 1838
p. 46 (D105) 13 September 1838

p. 47 (D100) 13 September 1838
p. 48 (D108, 112) 14 to 16 September 1838
p. 29x (D163) 25 September 1838.

Clearly, most of the references support a dating for these pages to September 1838.

Thirdly, the texts from p. 59 to p. 64 and from p. 30x to p. 32x (i.e. the last entries in the notebook) are concerned with house hunting in London. In Darwin's pocket 'Journal' which (as Sandra Herbert first pointed out in 1977: 208) seems to have been first used in August 1838, there is the following entry for 1838 (see *Correspondence* 2: 432): 'To the end of year House hunting'. Darwin took possession of the keys to 12 Upper Gower Street on 29 December 1838, so that one can say with reasonable confidence that these entries date from late November to December 1838.

THE ST HELENA MODEL AND DARWIN'S CRATER OF ELEVATION THEORY

As noted above, the first fifteen pages of the notebook form an essay on the geology of St Helena, and the words 'St Helena Model' are written on the notebook's cover (see

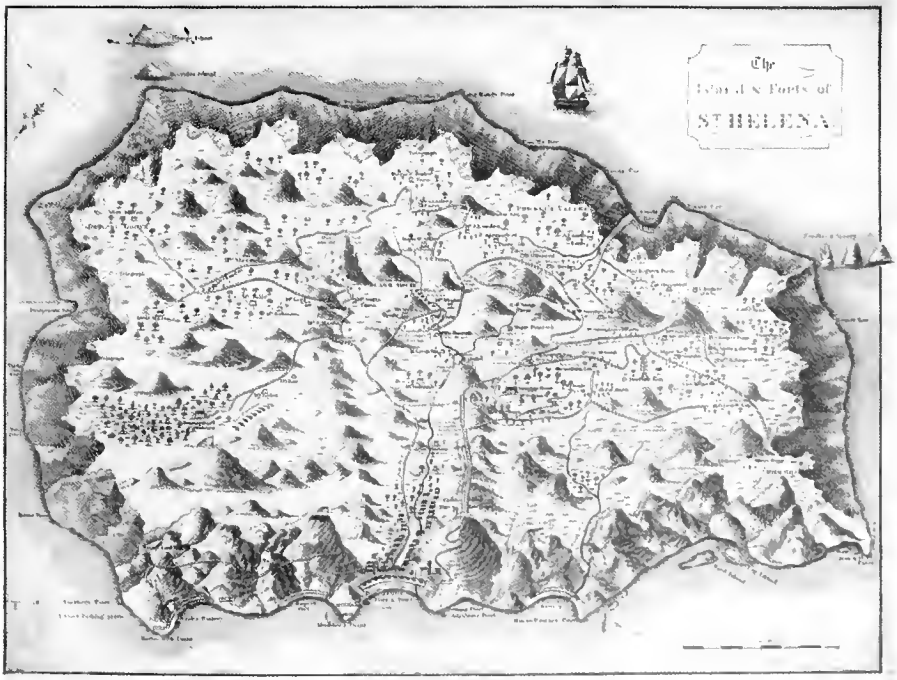


Fig 3 Map of *The Island & Forts of St Helena* (c.1815), scale of 2 miles = 1.75 inches, 25cm × 19cm. Courtesy of the Syndics of Cambridge University Library. (CUL Maps 546.81.1)

Fig. 3). In order to date this essay and to establish its significance, it is necessary to review Darwin's manuscript record concerning St Helena.

When H.M.S. *Beagle* visited St Helena in July 1836, Darwin took the opportunity to make a detailed examination of its geology, recording his observations in Down House notebooks 1.3 and 1.6. Aboard ship Darwin wrote up his personal diary, which is also today preserved at Down House, and sorted out his geological specimens, which are listed as numbers 3700–28 in the third of four catalogue notebooks which are now on deposit at Cambridge University Library. He also wrote up his detailed geological notes on paper watermarked Wilmot 1834; these notes are now at Cambridge University Library, DAR 38ii, ff. 920–35. At some point before the *Beagle* reached England, Darwin made some notes on St Helena in his Red Notebook, the most extensive being those on pp. 38–40, which he subsequently excised and are now in DAR 42, f. 84 (see *Notebooks*: 31).

While Darwin's servant and amanuensis Syms Covington was making a fair copy of his master's personal diary, probably in the early months of 1837, for eventual publication as *Journal of Researches* (hereinafter referred to as *JR*), Darwin prepared an additional section on the geology and natural history of St Helena. This section appears on pp. 581–3 of *JR*, but as Nora Barlow pointed out in her edition of the personal diary (Barlow, 1933: 439n58) the manuscript of this section appears to be lost, and cannot therefore be precisely dated.

In July 1837 Darwin opened the first two of his post-voyage *Notebooks*. Notebook A was devoted to geology, notebook B to species. Notebook A contains a reference to St Helena on p. 41: 'The fact of Galapagos Isld. steep side to windward in allusion to St. Helena discussion.' (*Notebooks*: 96). This note is on an excised fragment now in DAR 42, f. 25, which can be dated approximately to November–December 1837 (*Notebooks*: 83).

The next datable manuscript dealing with the geology of St Helena is a single sheet of Eyehorn 1837-watermarked paper, bound near the back of DAR 44. The recto of this document is dated 15 September 1838, and headed 'St Helena Model'; it is written in pencil with a few ink annotations and concerns the topography of the north-west and north-east coasts of St Helena. It is written in a similar style to, and clearly overlaps in subject matter with the first fifteen pages of the St Helena Model notebook. Both documents seem to have been written during or immediately after examination of the 'gigantic model' of St Helena, which we know Darwin saw at the East India Company's Military College at Addiscombe, which is now part of Croydon in Surrey (see Darwin 1844, hereinafter referred to as *VI*: 75 footnote; 1846, hereinafter referred to as *GSA*: 25). This dating for Darwin's work on the model is substantiated by a letter he wrote to an unknown recipient dated 12 September {1838}, in which he asks permission to examine the model, having apparently seen it 'some months since' (*Correspondence* 2: 103).

The model itself, which I have not been able to locate and which probably no longer exists, was constructed by Robert Seale, author of *The Geognosy of the Island of St Helena* (Seale, 1834).

The verso of the DAR 44 manuscript, reproduced here as Figure 4, is an inked-over pencil diagram showing cliff formation on the north-west coast of St Helena. It is clearly developed from the diagram on p. 38 of the Red Notebook, and via various intermediate states preserved in DAR 39ii was published in the section on cliff formation in *GSA*: 25–6; (see also *Notebooks*: 31n38–4).

The remaining manuscripts which deal with the geology of St Helena are a series of pencilled notes written, like the DAR 44 sheet discussed above, on Eyehorn 1837 paper and preserved as DAR 42, ff. 94–7. These too are mainly concerned with the subject of coastal erosion and they may well have been written at the same time as the DAR 44

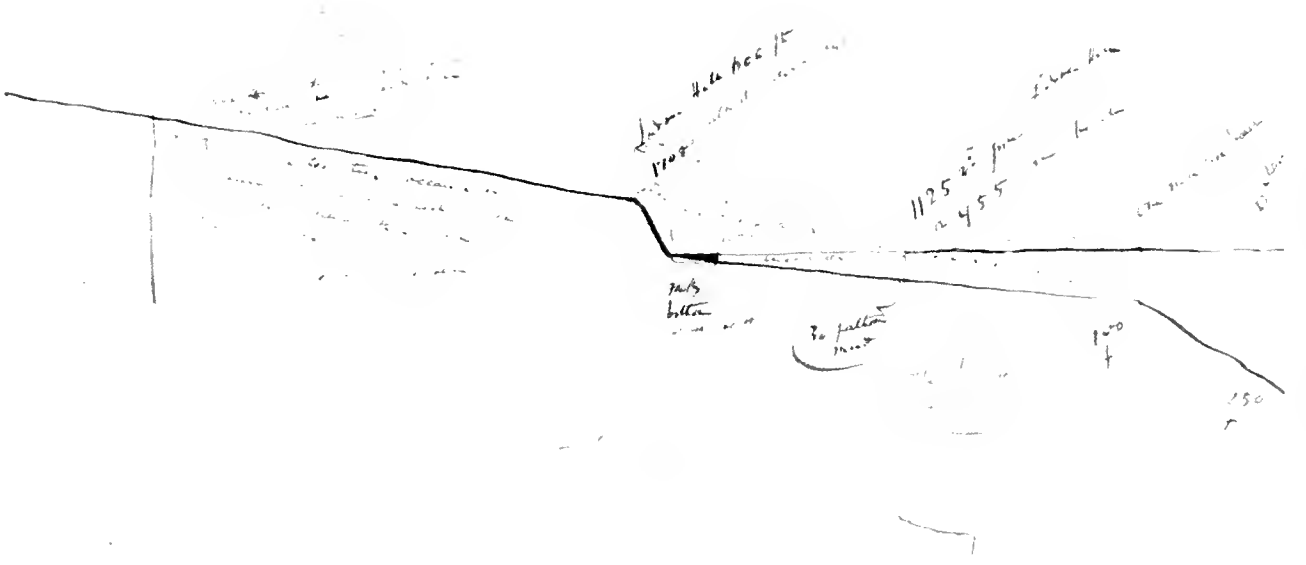


Fig 4 The verso of an unnumbered folio in DAR 44, dated 15 September 1838, which shows a section through the coastline of St Helena. The diagram appears on p. 25 in *GSA*. Courtesy of the Syndics of Cambridge University Library.

note. The geological notes in DAR 38ii are in places heavily annotated in pencil which may also have been written at the same time as the DAR 44 sheet. There is a light pencil note in the margin of DAR 38ii, f. 93l to 'V[*ide*] Model'.

There is one other line of evidence to support the dating of the first fifteen pages of the St Helena Model notebook to 15 September 1838 or thereabouts. This is the evidence from Darwin's pocket 'Journal' (see above, p. 207) of his scientific activities at that time:

> September 6th Finished paper on Glen Roy—one of the most difficult & instructive tasks I was ever employed on
> Sept. 14th Frittered these {foregoing days *added*} away in working on Transmutation theories & correcting Glen Roy Began craters of Elevation Theory

Burkhardt & Smith (1987, *Correspondence* 2: 436n24) were not able to locate any manuscript by Darwin dealing with his novel explanation for the form of islands such as St Jago, Mauritius and St Helena. Darwin published his 'Crater of Elevation theory' in a special section appended to the chapter on St Helena in *VI*: 93–6. Darwin's theory, in essence, was that certain types of volcanic islands which consisted of an outer ring of mountains, enclosing a more or less level inner plateau, were the result of differential uplift, with the inner area less elevated than the outer ring of mountains. Such islands—referred to by previous authors as craters of elevation—would otherwise have been explained as resulting from collapse of the inner area following blister-like elevation, or by postulating that the central part of the island had been destroyed by volcanic explosion.

In my opinion, knowing that Darwin began work on the theory on almost the same date that he made his notes on the model of St Helena, we may identify all the Eyehorn 1837-watermarked manuscripts itemized above, and possibly also the annotations to the *Beagle* notes on St Helena, together with the essay at the start of the St Helena Model notebook, as Darwin's surviving manuscripts on 'Craters of Elevation'.

EDITORIAL CONVENTIONS

In the following transcription of Darwin's 'St Helena Model' notebook the original spelling and punctuation have been retained, together with the horizontal lines Darwin drew across the page to mark off pieces of text. All other markings, such as vertical cancelling lines and marginal scoring have been ignored. Notes to the text are indicated by superscript numbers. All editorial matter is included in square brackets and is italicized. Page stubs have not been transcribed. It should be noted that there are no obvious annotations in this notebook, in the sense of text added much later than the main body of the text. This is in marked contrast to some of Darwin's other notebooks (see *Notebooks*: 12).

‹ › Darwin's deletion
‹‹ ›› Darwin's insertion
bold type written in ink
illeg illegible
/– –/ doubtful reading

Page numbers are given in square brackets. Excised pages are signified by the notation 'e'.

ACKNOWLEDGEMENTS

My thanks are due especially to the Royal College of Surgeons, for allowing me to publish the 'St Helena Model' notebook, and for agreeing most generously to depositing the notebook temporarily at Cambridge University Library so that I could work on it there. It is a pleasure also to acknowledge the help I received at Cambridge from Mr Peter Gautrey, whose ability to read Darwin's handwriting has aided my task a great deal, but who is in no way responsible for the accuracy of the present edition. I am grateful also to Dr Sandra Herbert of the University of Maryland, who has greatly improved my work at several stages and encouraged me to complete the project, as has my partner Allison Butt. Finally I thank the Syndics of Cambridge University Library for permission to quote from manuscripts in their care, and for providing the illustrations for this paper.

[FRONT END PAPER[1]]

[1] An Elevation inter=
=mediate between
Longwood[2] &
Alarm house[3]
will give
mean inclination
of stream before
elevation at
Flagstaff[4]

---

[2] /–Bluimans–/[5] probably
modern lava.

Horse pasture[6]
island slopes
impossible to guess
what it is

High Hill[7]. I
should think external
‹‹a ‹little› more elevated then rest
of ring››
/–Vide–/ basalt & V[*ide*] specimens

[3] *Hollow* ‹‹on coast›› near Man
& Horse[8] I should ‹‹certainly››
think end of ‹‹?capped with
/–Lava–/ & elevated ?››
external ring: to

The S. [*illeg*] Is
like inside of
Crater.

/–Evidently–/ great
/–remnant–/ near
Flat Rocks.[9]

[4] ?‹‹very doubtful›› Whether any
old rocks near
Flat rocks?

Asses ears[10] so very
near coast

South Barn[11]
I should think
Basaltic, as well
as Long Range
point[12] × × ×

[5] Cuckolds point[13]
2672

Hally's Mount[14]
2400

According to
colouring, base of
Man & Horse[15]
‹external› basaltic

× × × × & I can
scarcely doubt great

[6] Stone top[16] ‹‹is likewise basaltic››

High Hill[17] most

anomalous

Part of Barn[18]
nearest to Flagstaff[19]
higher than seaward
point from
elevation –

The form of South

[7] Barn[20] would lead
to supposition that
it dipped to SE by
S. –

If we complete the
crater‹s› /–by–/ Green Hill[21]
/–to–/ Nest [Lodge *written over* '*Loge*']^[22], the
longer axis will be
parallel to S. Coast
as /–rise–/ of Green

[8] Hill is nearly obliterated
We need not be surprised
at SW part of
circle being entirely
obliterated

The /–state–/ of outer
/–ring at–/ (/–true–/ SW)
point, is quite
doubtful.·. cause
of dip of S Barn[23]
doubtful. –

---

[9] Excepting from
disturbance at the
/–?–/ Barn[24] axis of
Crater parallel to
island. –

New crater placed
rather at one
end of ring of
Rocks

Lot. Lots Wife[25] &
& Flagstaff[26] in line

[10] connection true
or false?

The tops of
basaltic masses
stick up
above the modern=
strewn all round
a little higher

---

[11] The lava of Flagstaff[27]
did not proceed
‹over› from so
low a place as
‹Consons› Casons Gate[28]

When I talk of
dip from High
/–Peak[29] have–/ I said
SW for NW!!!??

[12] The irregular
position of the
external /–knobs–/,
/–would certainly–/
appear more
probably due to
elevation, than
‹‹to›› crater of subsidence

Appears to have

[13] less regularity,
than true crater
tho' having
crateriform
dip

Prosperous Bay[30]
Flagstaff ought[31]
to have dipped
due E.

[14] Barn[32] NE
ought to have
dipped

South ‹‹Barn››[33] ought to
have dipped
S by E

From black angular

[15] projecting ‹‹mass›› at base
of Man & Horse[34]
no doubt external
basaltic, but
top too smooth
I must suspect
structure like
Flagstaff[35]

---

[16] Dr Lind/–stay–/[36] Curator

Ask Gould[37] about
East Indian & Australian
Birds. with respect
to /–islets–/[38]

Eyton[39]—Waterhouse[40]
think/–s grey–/ with black
bars cat differ species
from small tortoise=
shell cat[41]—skeletons
Do get shepherds tail

[17e–20e]

[21] Sulivan[42] get head of
ox called "Nata"[43]

History of cross breeds

Gould drawing of
ostrich[44]

D'Orbigny[45] is giving
figure shells from
Cordillera[46]

Ear Doctor[47]

---

[22] Tell Lyell[48] of Desnoyers
Paper[49]

Tell Mr Owen[50]
of Caout chouk[51]
to stop bottle

There are some
admirable tables
of distribution of
reptiles of ‹S. America›
/–bound–/ in Suites
de Buffon[52], of

[23e–24e]

[25] /–Wrappers–/ ??
about sending to Subscribers[53]

Stewart[54] about payment
of the 100 guineas
for Gould[55]

Curtis[56] my bill

Dr Smith[57] sharks
teeth Navedad
Chile

/–will examine them
hereafter–/

[26] Major Mitchell[58]

Height of Escarpment
of Blue Mountains
‹‹do hybrid dogs ‹foxes› /–Austral–/ dogs. breed.–[59]››
Depth of rivers near
mouths[60]

Any Fossils /–in the–/ Sandstone[61]
/–Pecten Terebratula–/

Name of Mr Brown[62] leaves[63]

Do Australian dogs hunt in packs[64] /–Watuaya–/

Woodcut of Bomb[65]

[27] Pay Lonsdale[66] Geolog
Transactions
Pseudo-strata.
-craters.

? May I quote your statement

about steep shore deep beneath water.[67] find out about cliffs on banks of rivers.

At *Head* of /–Grose–/ are there cliffs & confine attention to this *one* valley yes
Do the rivers continue deep a little way above tidal action ‹‹no cliffs›› /–Look out for shells with bones not always cliffs–/

[28] [*two illeg words*]
Henrietta /–St–/ Bath[68]
would probably answer letter
& give information
about tailless breed of
cats[69] (origin?) near
Walmesbury breed??

Wiltshire sheep. with
teeth pushing each
other out
Plants from Henslow[70]

Sulivan[71] about
English Weeds
Fennel, Sow Thistle
/–Reach—/

[29e–34e]

[35] Council of
Geolog Soc
for map of
Scotland

Dunford field
/–Church–/ St

/–Last–/ number of Lancet, account of Owen & Magnetism[72 73]

[36] Vol. VII Ed. T.
p.157[74] Sir J Hall
states that "a ‹‹large›› block
of ‹rock› ‹‹stone›› 4 or 5 ft
in diam, lying within
high water mark, &
well known as ‹‹having›› serving
to denote the boundary
of two estates was
/–during–/ a stormy night
in water transported
90 yards, & the person
on the /–spot was confused–/

[37e–40e]

[41] all preserving their
NE dip

Miss Martineau p. 213[75]
Charity everywhere
‹‹I doubted it at first›› Byron & the Fuegian women Have any

---

other associated animals
charity—cows not
wild cattle & [*illeg*]

[42] Wouett on Cattle[76]
Waterhouse, has it[77]

Ask [**Fox**[78] *ink over pencil*] to
experimentise[79]
on Frogs spawn & to
procure eggs of
Land Snail, for me—

Owen's Edition
of ‹‹**Hunters's**›› Animal
Economy[80]

[43e–44e]

[45] n.b.

Pintail & Common
Duck to get
some half /–breed–/[81]

Bring Picture
for /–M–/

Cross between Black
Grouse Ptarmigan[82]

Pheasant & Grouse in[83]
wild —when species decreasing

[46] Capercailzie[84]

Black Grouse &
subalpina[85]

Anthus S. American
species.– furthest
south—Anthus
going further ‹South› ‹‹North››
than S. American
species[86]

[47] Mr Yarrell[87] 3″6d

for number of
Physiology[88]

Mr Yarrell [1765 *written over '1780'*],
has book history of
Pidgeon.[89]

Treatise on Domestic
Pidgeons—very
curious, in comparison
for time,—Mr Yarrell
has /–recent–/ comparison

[48] Has rock Pidgeon
‹pouter's› specks on
shoulder, Pouters
have specks[90]

Have any new
varieties of Pidgeons
been established?[91]

There must be laws of
variation chance would never
produce feathers or make
breed—[92] ?eat without legs?[93]

[49e–58e]

[59] /–modesty [‹‹*two illeg words*››] &
shame–/
Mr Fuller 8 Albany
Place — /–11–/ Regent
Park — 200£[94]

Albany St. 70£.
per annum
no 161 — 100£ per annum

Another further up
this street 80£
no 27

[60] Clarges St.–

Montague Place
House. Parker
Keppel St Agent
Furnished

Kemp & Son
37 Judd St.
House in Woburn
Place—no 20

[61] Pearsall & Jorden
1. Bernard St
Russell Square
House in do

12 Upper Gower[95]
St. Furnished or
unfurnished. ‹‹must be latter››
Furniture
at Valuation? Pearsall
& Jordan: 100 year
with *stables:* 4 years–

[Will hear on Tuesday from France
written up left margin]

[62] Mr Stokes[96] 4
North Place
Gray Inn Lane

Gordon Square
40
Built /–two–/ years

‹Upper› ‹‹20›› Woburn Place
bare. (with fixtures
some) want some
painting ‹‹Landlord probably will
do no more›› rather
nice house –

[63] offices rather bad.
look out /–believing–/
moderately good
140 Kemp &
Son [37 '3' *written over* '2'] Judd St
with stables

---

17. Woburn Place
to Purchase Furniture
rent 110 Lease 7 or
14

[64] Tavistock Square[97]
2 houses from–
near Mr /–Crompton's–/
145£: New
House belonging to Cubitt[98]

Regent Square.

[INSIDE BACK COVER]
2/6
Lyell[99]
Geograph Journal
1839 p. 288
Subsidence
at Tyre[100]

[Back end paper excised]

[1xe–4xe]

[5x] by seeds or not? & what
will it go back to?

Give Miller[101] a
hint, about specimens

[378 yellow *encircled*][102]

Von Hoff translated??[103]

Take the passage
& see about my mistake

[6x] Lonsdale: S. American
Fossils?[104]

Correction for Lyell
in little Book[105]

Lyell Vol.II Poggendorf
Annalen about Albite
ask /–Lyell–/ to look[106]

‹[*illeg*]›

Earle[107] Tristan D'Acunha[108]

Mr Whewell[109] depths at
which sea breaks[110]

[7x] Cone of Tree from Chile[111]

Mr Brown/–e–/
Bomb[112] [‹‹cannot find it›
+ Mark of Tree *boxed*] –
Is Australian wood coniferous[113]
[‹‹**yes all I brought**›› *ink over pencil*]
‹‹nearly all filled with agate /–Red
Jasper–/ does not››
+Norfolk Isld
Macquarie Is??

---

where can I get account?

Australia & S. America
at all allied Flora.

Wild dogs on West Coast
See 1/–st–/ Vol of Geograph
Journal[114]

Bog Iron ore
infusoria[115]

Fern ‹‹of Australia›› being found in
India.

Ask directions about good
lens in Paris.–

[8x] Lyell flint in Potteries[116]

Owen tooth in Sir Woodbine's[117] possession[118]

[9xe–10xe]

[11x] Vol III p. 30 Lyell[119] wrong about P. vulpina Waterhouse

---

?Type? size for Zoological

Ask Baillière[120]

Roget, Bridgewater[121] Treatise

Translation of Muller[122]

[12x] Ice transport of storm in Frith of Forth p. 157 VII Vol ‹‹& 8th›› Edinburgh Transact[123]

Have they ‹‹a›› Leucopterus from Falkland Isd at Brit Museum for comparison with those from T del Fuego brought by King[124]

[13xe–18xe]

[19x] Ask Dr Smith thickness of sandstone at C. of Good Hope[125]

How high is the capping of sandstone on Lions Head 2100ft above sea

---

Corvus do Mar for Henslow[126]

[Whether litters of true hybrids are heterogenous or homogenous *written upside down*][127]

[20x] Dr Smith[128] /–Quartz–/ Rock. no formation of ?? with respect to origin of sandstone[129]

Granite large Formation????

Ask Lonsdale[130] about ‹‹stalagtite layer on›› Chalk & look at [*three illeg words*]

(with the exception of some quartz Hills on ‹near› the West Coast near the mouth of Orange River) Dr Smith.–[131]

[21xe–22xe]

[23x] Tooth of Mastodon[132] for Merchant

Sonnerat[133] has given account of Seychelles Voyage aux Indes Orientales 1774 1781 Gould[134] has seen Parrot

---

[24x] /–Cheiroptamus–/[135]

Exact Locality

Cast

Sir P Egerton[136] says that Kaup[137] considers M. augusti= dens[138] as only found in India– European species ‹come from› are M. longirostris

---

[25x] Jaw of Elephant in
Geolog Soc

Edin Transacts
Vol. VI p 165[139]
considers Somma
is fragment of large
volcano Sir J
Hall

---

do p. 173[140] Has seen
clay stiff enough for
potters use with
/–great–/ crystals of ice
/–found–/ in them, &
fragments of rock, with
angles ‹stay› sharp, yet with
[character completely altered &
two illeg words superinduced
written up right margin]

[26x] Edentate Head. one plate[141]

Mastodont one plate

---

4 Plates
2 Plates for little
bones

---

1 Tessalated covering
6 Scelidotherium
1—Lower jaw
1 Megatherium
1 && [18 *boxed*] 2″18

[27x] Theory of Volcanos
‹‹/–Count–/›› Byelandt
Palstercamp[142]

Rat from
Australia??[143]
Owen– fossil –[144]

Shall I give Institute
/–d'–/France Mammalia[145]

Lyell Volcanic
Dust[146]

[28x] /–Macaio–/
Is there any relation
between boss of Indian
cattle & structure
Bison &c[147]

Analyse this in
all cases whether
variation /–assumes–/
character allied to
specific ones
same genus —

[29x] **Write to Sulivan[148] to
enquire about wild
‹‹Have they long ears & what
colour??››
dogs on the Pampas**

**Do male animals lose
passion from breeding in &
in.–[149]**

**How many generations was
this effected in case of
Bantam & Polish Cochin[150]
in Pidgeons how many generations
old on an
average[151]**

[Vertebra of Indian Cattle *ink over pencil*]*[152]*
Eyton. dissect.–[153]

Skeletons of Pidgeons
1/2 one. 3. oclock
1/4 . 1 . 1/2 past one

[30x] Pay Lyell[154]for
Pritchard[155]Chemical Co/–ncre–/
tions
Volcanic Dust[156]_____
Remnants of Carpets[157] Mat for
Hall
Windows cleaned
Staircase cover washed
Walls cleaned
white curtains washed

[31x] Two easy chairs

Blinds in red
Rooms washed

Muslin all to be
washed

[Lyell[158]

T. Carlyle[159] – Public
Library

Flint in Pottery
——*written upside down*][160]

[32x] Common table &
2nd Washing stand

Lyell[161]–Maclarens[162] has written
on Salisbury Craigs

NOTES

Biographical notes are adaptations of those given in the *Correspondence*.

1. There are five lines of illegible very feint words written on the inside front end paper.
2. Longwood (elevation 1760′) was Napoleon's residence on St Helena; it is located in the east-central part of the island (see Cross, 1980).
3. Alarm House (elevation 1960′?) is approximately 1 mile west of Longwood.
4. Flagstaff Hill (elevation 2275′) is on the north-east coast, overlooking Flagstaff Bay.
5. Not identified.
6. Horse Pasture is a large sloping area about three miles south-west of Jamestown.
7. High Hill (elevation 2314′) is about two miles south of Horse Pasture.
8. Man and Horse is a high cliff area at the south-west corner of St Helena.
9. The Flat Rocks are two of the islets off the southern tip of St Helena.
10. The Asses Ears (elevation about 1660′) are two peaks at the the southern tip of the island.
11. South Barn is presumably Sandy Bay Barn (elevation 1413′) which is in the centre of the south coast, on the eastern side of Sandy Bay.
12. Long Range (elevation 1936′) and Long Range Point are on the south-eastern edge of Sandy Bay.
13. Cuckholds Point (elevation 2672′) is in the centre of the island, on the northern rim of Sandy Bay.
14. Halley's Mount (elevation 2200′) is halfway between Cuckhold's Point and Alarm House. It was from this point that Edmund Halley observed the transits of Mercury and Venus in 1676.
15. See note 8.
16. Great Stone Top (elevation 1620′) is near the south-east corner of the island.
17. See note 7.
18. The Barn (elevation 2019′) is at the north-west tip of the island.
19. See note 4.
20. See note 11.
21. Green Hill (elevation 1650′) is about 1 mile south of Cuckhold's Point.

22. West Lodge (elevation 2200′) is about 1 mile east-south-east of High Hill. Darwin both here and in *VI* refers to it as Nest Lodge.

23. See note 11.

24. See note 18.

25. Lot (elevation 1489′) and Lot's Wife (elevation 1516′) are peaks in the interior of Sandy Bay.

26. See note 4.

27. See note 4.

28. Casons Gate has not been located.

29. High Peak (elevation 2616′) is about 2 miles east of High Hill. Darwin's question to himself here almost certainly relates to his *Beagle* notes (DAR 38ii, f. 929).

30. Prosperous Bay is on the north-east coast of St Helena.

31. See note 4.

32. See note 18.

33. See note 11.

34. See note 8.

35. See note 4.

36. Not identified.

37. Gould, John (1804–81). Self-taught ornithologist and artist. Taxidermist to the Zoological Society of London, 1826–81. Described the birds collected on the *Beagle* expedition (Gould, 1838–41). FRS 1834.

38. Related matter appears in B249.

39. Eyton, Thomas Campbell (1809–80). Shropshire naturalist and collector of bird skins and skeletons. Friend and Cambridge contemporary of Darwin.

40. Waterhouse, George Robert (1810–88). Naturalist. A founder of the Entomological Society, 1833. Curator, Zoological Society of London, 1836–43. On staff of the British Museum 1843–80. Described some of Darwin's entomological specimens from the *Beagle* voyage (see Smith, 1987) as well as the *Beagle* mammals (Waterhouse, 1838–9).

41. 'Waterhouse thinks two main divisions of cats. Tortoise shell & grey-banded. ?species?' B250.

42. Sulivan, Bartholomew James (1810–90). Naval officer and hydrographer. Lieutenant in the *Beagle*, 1831–6. Surveyed the Falkland Islands, 1836–46 (Moore & Scannell, 1986). Admiral 1877.

43. Nata cattle are described in *Variation* 1: 89–91. They may also be the subject of a manuscript Darwin sent to George Robert Gray in December 1838 (see *Correspondence* 2: 136).

44. Almost certainly a reference to Gould's illustration of Darwin's Rhea, *Pterocnemia pennata* d'Orbigny, which was published in Gould (1841).

45. D'Orbigny, Alcide Charles Victor Dessalines (1802–57). French palaeontologist who travelled widely in South America, 1826–34.

46. Probably a reference to the figures of South American fossils which appeared in the 'Atlas de la partie historique' of d'Orbigny (1846).

47. Colp (1977) does not seem to have found any evidence that Darwin had any ear complaint.

48. Lyell, Charles (1797–1875). Uniformitarian geologist. Professor of Geology, King's College, London, 1831–3. President of the Geological Society, 1834–6 and 1849–50. Scientific mentor and friend of Darwin. FRS 1826. Lyell was in Scotland from late August until mid-November 1838 (Wilson, 1972).

49. Possibly Desnoyers (1831–2), although Lyell already knew of this paper (*Notebooks*: 405n35–1).

50. Owen, Richard (1804–92). Comparative anatomist. Assistant conservator at the Hunterian Museum, Royal College of Surgeons, 1827; Hunterian Professor, 1836–56. Superintendent of the Natural History Department of the British Museum, 1856–84. Described the *Beagle* fossil mammal specimens (Owen, 1838–40). FRS 1834.

51. Caoutchouc, or India-rubber, could be used to seal a bottle.

52. An almost identical reference occurs on D40 and the 'Suites' are also referred to on D179 and on the inside back cover of C (*Notebooks*: $327n_{IBC}$–4). The D40 note was made between the 19th and 22nd of August 1838.

53. Presumably a reference to subscribers to the *Zoology* (Freeman, 1977; *Correspondence* 2).

54. Mr Stewart of Stewart and Murray, printers of the *Zoology*.

55. See note 37.

56. C. M. Curtis, artist for the *Zoology* mammalia volume (Waterhouse, 1838–9), no.2 of which appeared in September 1838.

57. Smith, Andrew (1797–1872). Army surgeon stationed in South Africa, 1821–37. Principal Medical Officer at Fort Pitt, Chatham, 1837; Deputy Inspector-General, 1845. Director-General, Army Medical Department, 1853–8. FRS 1857. Darwin collected sharks' teeth at Navedad in 1834 (see *GSA*), but I can trace no connection between Andrew Smith and South America or sharks' teeth.

58. Mitchell, Thomas Livingstone (1792–1855). Surveyor-General, New South Wales, 1825–55.

59. See C159,189 and D180 on the subject of breeding between native and european dogs.

60. See *VI*: 135 for Mitchell's information on Australian river valleys, published in Mitchell (1838). Darwin records a communication with Mitchell, probably datable to April 1838, on the same subject (see *Notebooks*: 113n92–1).

61. Probably a reference to fossils from Tasmania, judging from the proximity to the following reference (note 62). See Banks (1971) and DAR 40, ff. 45–9.

62. Brown, Robert (1773–1858). Botanist. Librarian to Joseph Banks, 1810–58. Keeper of the Botanical collections, British Museum, 1827–58. FRS 1811. Mabberley (1985).

63. The text on pp.26–7 is drawn over heavily with doodles and sketches of plants. These may be fossil plants from Tasmania given to Robert Brown for description. See fig. 1, and *VI*: 140.

64. 'Major Mitchell is not aware that Australian dogs ever hunt in company–' C213. Entry made in the early summer of 1838.

65. May refer to the woodcuts of volcanic bombs in *VI*: 36, 38.

66. Lonsdale, William (1794–1871). Geologist. Served the Geological Society from 1829 to 1842, first as curator and librarian, and after 1838 as assistant secretary and librarian. Lonsdale was a frequent source of information for Darwin.

67. This question may be directed at Major Mitchell. See note 60.

68. Henrietta Street is near the centre of Bath.

69. 'There is a breed of tailless cats, near Bath. Lonsdale' C175. William Lonsdale (see note 66) provided Darwin with other examples of varieties of domesticated animals (*Notebooks*: 293–4).

70. Henslow, John Stevens (1796–1861). Clergyman, botanist, and mineralogist, Cambridge University, 1822–7; Professor of Botany, 1825–61. Darwin's teacher and friend. The background to Henslow's involvement with plants collected by Darwin is given in Porter (1985).

71. See note 42.

72. The last two lines are written horizontally as was the previous page of text, judging from words on the stub of 34e. The other lines on p.35 were written vertically in the remaining blank space.

73. See note 50. The reference has not been traced, although there was correspondence on 'animal magnetism' in *The Lancet* at this time (e.g. issue of September 22, p. 34).

74. Hall (1815) is also referred to in A36. See also note 123.

75. 'Miss Martineau (How to Observe p. 213) says charity is found everywhere (is it not present with all associated animals?) I doubted it in Fuegians, till I remembered Bynoes story of the women.–' M142. This entry was made between 13 and 15 September 1838. Note that the name in the St Helena Model notebook is clearly Byron. The reference is to Martineau (1838). See also *Correspondence* 1: 520.

76. Youatt (1834).

77. See note 40. 'Wowett on Cattle– (Waterhouse has it)' C_{IBC}.

78. Fox, William Darwin (1805–80). Darwin's second cousin. A close friend at Cambridge who shared Darwin's enthusiasm for entomology.

79. 'Experimentise on land shells in salt water & lizards do.–' B248.

80. Hunter (1837), listed on C270. See note 50.

81. Hybrid pintail and common ducks are referred to on D25,26,33,89,IBC. See also *Natural Selection*: 433n1, and *Variation* 2: 45.

82. Crossing between black grouse and ptarmigan is referred to on D72, dated 8 September 1838 and on D105–6, datable to 13 September 1838. The subject is dealt with in some detail in *Natural Selection*: 434–6, and Darwin's interest in it seems likely to have originated during his fieldwork at Glen Roy in late June 1838. See *Notebooks*: 345n43–1.

83. Grouse-pheasant hybrids are mentioned on B189,D33,105–6 and E106. See note 82.

84. The capercailzie is mentioned on D73 and 105.

85. See note 82.

86. Probably a reference to *Anthus correnderr* Viellot, mentioned in Gould (1839: 85) as having 'probably a further range southward than any other land-bird in the southern hemisphere.'

87. Yarrell, William (1784–1856). Zoologist. Engaged in business as newspaper agent and bookseller in London. Wrote standard works on British birds and fishes.

88. Possibly Hunter (1786) or (1792), listed on C267.

89. Moore (1765). An almost identical entry occurs on D100. See *Notebooks*: 362n100–1. This cross-reference almost certainly dates to 13 September 1838.

90. This is discussed on D100–1. See *Notebooks*: 362n100–2, and note 89.

91. 'as in pidgeons no new races.–' D104.

92. I agree with the reading of this page given in *Notebooks*: 362n100–2, although the phrase may be 'produce feathers and make bones'. Very similar wording occurs on D112.

93. 'Yarrell told me of a cat & a dog, born without front legs–' D108. 'if armless cat can propogate' D112. These pages are datable to between 14 and 16 September 1838.

94. Darwin started househunting on or about 25 November 1838 (See *Correspondence* 2: 120).

95. Freeman (1982) gives an excellent account of the events leading up to the establishment of the newlywed Darwin household at 12 Upper Gower Street ('Macaw Cottage') in January 1839.

96. This may be Charles Stokes (1783–1853). See Wilson (1972, chapter 10).

97. A prospective house in Tavistock Square is mentioned in a letter from Darwin to Emma Wedgwood dated 27 November 1838 (*Correspondence* 2: 129).

98. Thomas Cubitt (1788–1855) is mentioned as the developer of Tavistock Square in Freeman (1982).

99. '2/6' is written in the top left hand corner. It is presumably the price of the notebook (two shillings and six pence).

100. This reference of 1839 is the latest date in the notebook. The reference is to De Berthou (1839). The only other reference to the 1839 volume of the *Journal of the Royal Geographical Society of London* in Darwin's handwriting of which I am aware is the annotation on the letter from J. G. Malcolmson of 7 October 1839 (*Correspondence* 2: 225).

101. Miller, William Hallowes (1801–80). Mineralogist and crystallographer. Professor of Mineralogy, Cambridge University, 1832–80. FRS 1838.

102. Geological specimen 3378, from Tahiti. There is a note in Darwin's specimen catalogue (on deposit at CUL) to 'V. app[*endix*] p. 19', which is a reference to DAR 39.1,f.88. The specimen is mentioned in a note from J. S. Henslow dated 5 November 1837–March 1838 (*Correspondence* 2: 55n2), in Darwin's letter to Henslow of 26 March 1838 (*Correspondence* 2: 79n4), and in Darwin's letter to W. H. Miller of 16 October–27 November 1842 (*Correspondence* 2: 339n2).

103. Presumably Hoff (1822–24).

104. See note 66. One explanation of this entry is that Darwin was entertaining the possibility of William Lonsdale describing at least some of his invertebrate fossils from South America. In the event Lonsdale described Darwin's fossils from Tasmania (Lonsdale 1844) while George Brettingham Sowerby (1788–1854) and Edward Forbes (1815–54) described Darwin's Cenozoic and Mesozoic fossils respectively (Sowerby 1846, Forbes 1846). Darwin enquired concerning Sowerby's credentials for the task in a letter to J. S. Henslow of October 1836 (*Correspondence* 1: 512n4). Sowerby also described Darwin's shells from the Cape Verdes and from St Helena and Tasmania (Sowerby 1844).

105. Possibly a reference to Lyell (1840). Darwin was reading this work in manuscript in September 1838 (see *Correspondence* 2: 107n8).

106. Lyell (1837,2: 175) 'According to Von Buch, the American volcanic rocks contain generally less albite instead of common felspar as a principal ingredient (Poggendorf's Annalen, 1836, p. 190).'

107. Earle, Augustus (1793–1838). Artist and traveller. Artist in the *Beagle*, 1831–2. Hackforth-Jones (1980).

108. Augustus Earle spent nine months on Tristan da Cunha in 1824 (see note 107). Darwin may have been interested in the action of waves on the island (see note 110).

109. Whewell, William (1794–1866). Mathematician and historian and philosopher of science. Tutor at Trinity College, Cambridge, 1823–38; Master 1841–66. Professor of Mineralogy, Cambridge University, 1828–32. FRS 1820.

110. In a letter to Robert Mallet (1810–81) of 26 August 1846 Darwin says he consulted William Whewell (see note 109) on the subject of waves while preparing *JR*. See *Correspondence* 3: 335. In A59 the subject of breaking waves is mentioned with respect to Tristan da Cunha (see note 108).

111. See note 62.

112. See note 65.

113. There is a general connection between these entries and those on B187 and C238–9.

114. The wild dogs of King George's Sound are discussed by Nind (1832: 29).

115. See Ehrenberg (1837), mentioned on A93 (*Notebooks*: 114n93-1).

116. See notes 140 and 160.

117. Parish, Woodbine (1796–1882). Diplomat. Chargé d'affaires in Buenos Aires, 1825–32. FRS 1824.

118. Possibly a reference to the 'single detached tooth' of a *Megatherium*, mentioned as having been in Parish's collection by Owen (1840: 102).

119. 'Thus the Phalangista vulpina inhabits both Sumatra and New Holland' Lyell (1837, 3: 30). Lyell took his reference from Temminck (1827: 16, 19). Waterhouse told Darwin that he did not believe Temminck's statement to be true, in a letter sent to 12 Upper Gower Street (and therefore dating from the last few days of 1838 at the earliest; see *Correspondence* 2: 154). There is a very similar entry in B249e (*Notebooks*: 232–3).

120. Baillière, Hippolyte (d.1867). Bookseller and publisher in London who specialised in French medical and scientific texts.

121. Roget (1834).

122. Müller (1838–42).

123. Hall (1815: 157). This entry cross-refers to p. 36 (see note 74). It is not clear why Darwin has added a reference to the eighth volume of the *Transactions of the Royal Society of Edinburgh*.

124. See King (1828: 423–6).

125. See note 57. The sandstone, which is 2000 feet thick, is described in *VI*: 150–152.

126. See note 70. A mistake for Cocos do mer, mentioned on E164 in relation to discussions with Henslow on 27 May 1839.

127. 'Are the hybrids of those species. which cross & are fertile heterogenous' D_{IBC}. See *Notebooks*: 345n43–1.

128. See note 56.

129. These two entries relate to information given by Smith on the geology of South Africa (see notes 125 and 131).

130. See note 66.

131. This is presumably Smith's reply to Darwin's enquiry at the top of the page.

132. Darwin found *Mastodon* teeth at Gorodona (*GSA*: 87–8; Owen, 1840: 108). See notes 137–8.

133. Sonnerat (1782).

134. See note 37.

135. *Cheroptamus* Cuvier is an Eocene mammal related to pigs (Buckland, 1836 **1**: 80).

136. Egerton, Philip de Malpas Grey (1806–81). Of Oulton Park, Cheshire. Tory MP for South Cheshire, 1835–68. FRS 1831. Egerton was a vertebrate palaeontologist, specializing in fossil fish and footprints.

137. Kaup (1832–5).

138. *Mastodon augustidens* Cuvier is referred to on C46 and E32, the latter reference dated 26 October 1838. See note 132.

139. Hall (1812).

140. Hall (1812). An almost verbatim reference to the same observation occurs on A111, datable to before 11 August 1838. This may cross-refer to the subject touched on in notes 116 and 160.

141. This is a list of the plates thought necessary to illustrate the fossil mammalia of the *Beagle* (Owen, 1838–40). The following are the most probable identifications of the plates listed:

'Edentate Head'	*Glossotherium* in Owen (1839: pl. 16)
'Mastodont'	not illustrated
'Tessalated covering'	*Hoplophorus* Owen (1840: pl. 32, figs. 4–5)
'Scelidotherium'	*Scelidotherium* Owen (1839–40: pls. 20–8)
'Lower jaw'	*Megalonyx* in Owen (1840: pl. 29)
'Megatherium'	*Megatherium* Owen (1840: pl. 30)

142. Not identified.

143. Probably refers to a supposed fossil rat listed by Clift (1831), mentioned on C131 (see *Notebooks*: 278n131–1). See note 144.

144. See note 50. Possibly Darwin was seeking Owen's opinion as to whether the rat (see note 143) was correctly identified.

145. Darwin seems to be asking if he should donate a copy of Waterhouse (1838–9) to the Institute de France.

146. See notes 48 and 156. Lyell gave Darwin a letter written to him in March 1838 which reported volcanic dust falling on a ship at sea (*Correspondence* 2: 77–8).

147. A very similar passage occurs on D65, dated 7 September 1838. See also note 152.

148. See note 42. There are several entries concerning wild dogs of the world in the *Notebooks* (e.g. D7–8).

149. 'Breeding in & in Infertility & loss of passion ?? in Male?' occurs in draft 'Questions for Mr Wynne', datable to February–July 1838 (*Correspondence* 2: 71).

150. Closely related discussion occurs on D163, dated 25 September 1838.

151. '(. . & not effect of breeding in & in like our pidgeons)' D88.

152. See note 147.

153. See notes 39 and 151.

154. See note 48.

155. Prichard (1836).

156. See note 146.

157. See note 94.

158. See note 48.

159. Carlyle, Thomas (1795–1881). Essayist and historian. Darwin met Carlyle for the first time in November 1838 (*Correspondence* 2:128).

160. See notes 116 and 140.

161. See note 48. Lyell mentioned Salisbury Craigs in his letter to Darwin dated 6 and 8 September 1838 (*Correspondence* 2:99).

162. Maclaren, Charles (1782–1866). Established *The Scotsman*, 1817; editor, 1820–45. Wrote on geological subjects. Presumably Darwin knew of Maclaren (1839).

BIBLIOGRAPHY

Short Titles of Darwin Works and Editions

Correspondence
The Correspondence of Charles Darwin. **Vol. 1.** Eds. Frederick Burkhardt, Sydney Smith; David

Kohn, William Montgomery and Stephen V. Pocock. Cambridge 1985; **Vol. 2**: Eds. Frederick Burkhardt, Sydney Smith; Janet Browne, David Kohn, William Montgomery, Stephen V. Pocock, Charlotte Bowman, Anne Secord. Cambridge 1986. **Vol. 3.** *idem* 1987.

GSA

Geological observations on South America. Being the third part of the geology of the voyage of the 'Beagle', under the command of Capt. FitzRoy, R.N. during the years 1832 to 1836. London 1846.

JR

Journal of researches into the geology and natural history of the various countries visited by H.M.S. 'Beagle', under the command of Captain FitzRoy, R.N. from 1832 to 1836. London 1839.

Natural Selection

Charles Darwin's Natural Selection, being the second part of his big species book written from 1856 to 1858. Ed. Robert C. Stauffer. Cambridge 1975.

Notebooks

Charles Darwin's Notebooks, 1836–1844. Eds Paul H. Barrett, Peter J. Gautrey, Sandra Herbert, David Kohn & Sydney Smith. London and Cambridge 1987.

Variation

The variation of animals and plants under domestication. 2 vols. London 1868.

VI

Geological observations on the volcanic islands, visited during the voyage of H.M.S. 'Beagle', together with some brief notices on the geology of Australia and the Cape of Good Hope. Being the second part of the geology of the voyage of the 'Beagle', under the command of Capt. FitzRoy, R.N. during the years 1832 to 1836. London 1844.

Zoology

The zoology of the voyage of H.M.S. 'Beagle' under the command of Captain FitzRoy, R.N., during the years 1832 to 1836. Published with the approval of the Lords Commissioners of Her Majesty's Treasury. Ed. Charles Darwin. London 1839–43.

REFERENCES

Banks, M. R. 1971. A Darwin manuscript on Hobart Town. *Papers and Proceedings of the Royal Society of Tasmania* **105**: 5–19.

Barlow, N. 1933 (Ed.). *Charles Darwin's diary of the voyage of H.M.S. Beagle.* Cambridge.

Barlow, N. 1945. *Charles Darwin and the voyage of the 'Beagle'.* London.

Buckland, W. 1836. *Geology and mineralogy considered with reference to natural theology.* 2 vols. London.

Clift, W. 1831. Report by Mr Clift, of the College of Surgeons, London, in regard to the fossil bones found in the caves and bone-breccias of New Holland. *Edinburgh New Philosophical Journal* **10**: 394–5.

Colp, R. 1977. *To be an invalid: the illness of Charles Darwin.* 285pp. Chicago.

Cross, T. 1980. *St Helena, including Ascension Island and Tristan da Cunha.* Newton Abbott & London

De Bertbou, J. 1939. Extract from a notice on the site of ancient Tyre. *Journal of the Royal Geographical Society* **9**: 286–94.

Desnoyers, J. P. F. S. 1830–2. Sur les ossements humains des cavernes. *Bulletin de la Societé Géologique de France* **2**: 126–33.

Ehrenberg, C. G. 1837. Remarks on the real occurrence of fossil infusoria, and their extensive diffusion. *Scientific Memoirs* **1**: 400–7.

Forbes, E. 1846. Descriptions of Secondary fossil shells from South America. In *Geological observations on South America* . . . (see *GSA*): 265–8.

Freeman, R. B. 1977. *The works of Charles Darwin. An annotated bibliographical handlist*. 2nd ed. 235pp. Folkestone.

Freeman, R. B. 1982. *Darwin and Gower Street*. London.

Gould, J. 1838–41. *The zoology of the voyage of H.M.S. 'Beagle' under the command of Captain FitzRoy, R.N., during the years 1832 to 1836 . . . Part 3: Birds*. London.

Hackforth-Jones, J. 1980. *Augustus Earle, Travel Artist*. London.

Hall, J. 1812. Account of a series of experiments, shewing the effects of compression in modifying the action of heat. *Transactions of the Royal Society of Edinburgh* **6**: 71–186.

Hall, J. 1815. On the revolutions of the Earth's surface. *Transactions of the Royal Society of Edinburgh* **7**:139–67 (part 1), 169–211 (part 2).

Herbert, S. 1977. The place of man in the development of Darwin's theory of transmutation. Part II. *Journal of the History of Biology* **10**: 155–227.

Hoff, K. E. A. von 1822–24. *Geschichte der durch Ueberlieferung nachgewiesenen natürlichen Veränderungen der Erdoberfläche*. 3 vols. Gotha.

Hunter, J. 1786. *Observations on certain parts of the animal oeconomy*. London.

Hunter, J. 1792. *Observations on certain parts of the animal oeconomy*. 2nd ed. 273pp. London.

Hunter, J. 1837. *Observations on certain parts of the animal oeconomy . . . with notes by Richard Owen*. 506pp. London.

Kaup, J. J. 1832–5. *Description d'ossements fossiles de mammifères inconnus jusqu'à présent qui se trouvent au Muséum grand ducal de Darmstadt; avec figures lithographiées*. 4 vols. Darmstadt.

King, P. P. 1828. Extracts from a letter addressed by Capt. Philip Parker King, R.N., F.R.S. and L.S., to N.A. Vigors, Esq., on the animals of the Straits of Magellan. *Zoological Journal London* **3**:422–32.

Lonsdale, W. 1844. Description of six species of corals, from the Palaeozoic formation of Van Diemen's Land. In *Geological observations on the volcanic islands . . . (see VI)*: 161–9.

Lyell, C. 1837. *Principles of geology: being an enquiry how far the former changes of the earth's surface are referable to causes now in operation. 5th edition*. 4 vols. London.

Lyell, C. 1840. *Principles of geology: or, the modern changes of the earth and its inhabitants, considered as illustrative of geology*. 6th ed. 3 vols. London.

Mabberley, D. J. 1985 *Jupiter Botanicus. Robert Brown of the British Museum*. 500pp. Braunschweig & London.

Maclaren, C. 1839. *A sketch of the geology of Fife and the Lothians, including detailed descriptions of Arthur's Seat and Pentland Hills*. 235pp. Edinburgh.

Martineau, H. 1838. *How to observe. Morals and Manners*. London.

Mitchell, T. L. 1838. *Three expeditions into the interior of eastern Australia*. 2 vols. London.

Moore, J. 1765. *A treatise on domestic pigeons*. London.

Moore, D. M. and **Scannell, M. J. P.** 1986. Bartholomew Sulivan and early watercolors of the Falkland Islands vegetation in the National Botanic Gardens, Dublin. *Archives of Natural History* **13**: 155–163.

Muller, J. 1838–42. *Elements of physiology*. 2nd ed. 2 vols. London.

Nind, S. 1832. Description of the Natives of King George's Sound (Swan River Colony) and adjoining Country. *Journal of the Royal Geographical Society* **1**: 21–51.

Orbigny, A. C. V. D. d' 1835–47 *Voyage dans l'Amérique Méridionale . . ., exécuté pendant les années 1826 . . . 1833*. 9 vols. Paris & Strasbourg.

Owen, R. 1838–40. *The zoology of the voyage of H.M.S. 'Beagle' under the command of Captain FitzRoy, R.N., during the years 1832 to 1836 . . . Part 1: Fossil Mammalia*. London.

Porter, D. M. 1985. The *Beagle* collector and his collections. In **Kohn, D.** (Ed.) *The Darwinian Heritage*: 973–1019. Princeton.

Prichard, J. C. 1836–47. *Researches into the physical history of mankind*. 2nd ed. 2 vols. London.

Roget, P. M. 1834. *Animal and vegetable physiology considered with reference to natural theology*. 2 vols. London.

Rudwick, M. J. S. 1982. Charles Darwin in London: the integration of public and private science. *Isis* **73**: 186–206.

Seale, R. F. 1834. *The geognosy of the island of St Helena, illustrated in a series of views, plans and sections; accompanied with explanatory remarks and observations*. 25pp. London.

Smith, K. G. V. 1987. Darwin's insects. *Bulletin British Museum (Natural History) Historical Series* **14**: 1–143.

Sonnerat, P. 1782. *Voyage aux Indes Orientales et à la Chine, fait par ordre du Roi, depuis 1774 jusqu'en 1781.* 2 vols. Paris.

Sowerby, G. B. 1844. Description of fossil shells. In *Geological observations on the volcanic islands . . .* (see *VI*): 153–60.

Sowerby, G. B. 1846. Descriptions of Tertiary fossil shells from South America. In *Geological observations on South America . . .* (see *GSA*): 294–64.

Temminck, C. J. 1827–41. *Monographies de mammalogie, ou description de quelques genres de mammifères, dont les espèces ont été observées dans les différents musées de l'Europe.* 2 vols. Paris & Leiden.

Waterhouse, G. R. 1838–9. *The zoology of the voyage of H.M.S. 'Beagle' under the command of Captain FitzRoy, R.N., during the years 1832 to 1836 . . . Part 2: Mammalia.* London.

Wilson, L. G. 1972. *Charles Lyell: The years to 1841. The revolution in geology.* 553pp. New Haven & London.

Youatt, W. 1834. *Cattle: their breeds. Library of Useful Knowledge.* 600pp. London.

CONTENTS

Bulletin British Museum (Natural History)
HISTORICAL SERIES
Vol 18, No 2, November 1990