

## The Arachnida and Myriapoda collections at the Natural History Museum, past and present

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### Summary

The Arachnida and Myriapoda collections at the Natural History Museum are of world-class importance. They comprise over 30,000 jars of spirit, as well as more than 74,000 microscope slides, 180 drawers of dry, pinned specimens, and 40 drawers of spiders egg sacs and nests. Approximately 21,270 species are represented, although this estimate is below the number actually present. The purpose of this paper is to give a brief overview of the early history of the Arachnida and Myriapoda collection, to provide historical information of specific interest to researchers, to discuss the history of the section from 1990 to the present, and to detail all data sources available that relate to the collections, such as accessions registers, collections indexes, card indexes, reprints, databases, and archives. It is hoped that the information contained will provide a useful resource to potential researchers.

### Introduction

The Arachnida and Myriapoda collections at the Natural History Museum, London (NHM) are of world-class importance. They are utilized by scientists across the globe through visits, loans, and collaborative projects. Not only are the collections historically significant, they have direct relevance to the world today, in such areas as climate change, biogeography, human and plant health, and wildlife conservation.

The preservation of the Arachnida and Myriapoda collections is quite diverse. The largest component, by far, consists of the spirit collection, which comprises over 12,000 litres of industrial methylated spirit (IMS) in more than 30,000 jars. This is pretty much on par with other large world-class museums such as the Museum für Naturkunde in Berlin, which has 26,500 jars. In addition, there are over 74,000 microscope slides, 180 drawers of dried, pinned specimens, and 40 drawers of spider egg sacs and nests. The collections comprise approximately 18,003 species of Arachnida and 3,265 species of Myriapoda, although these totals are likely to be below the number actually present because some parts of the collection have yet to be databased.

The history of the Zoology and Entomology collections has been the subject of several papers and books (e.g. Stearn 1998; Hyatt 1975; Pocock 1906a,b). Stearn (1998) discussed several key staff and their work on the Arachnida and Myriapoda collections from 1886 until 1971, and Parker (1981) briefly touched upon the early history of the Arachnida collections. It is not the intention to merely regurgitate those facts and figures here. The purpose of this paper is four-fold: first, to give a brief overview of the earlier history of the Arachnida and Myriapoda section in order to provide a context in which to discuss recent changes;

second, to provide historic information of specific interest to researchers; third, to discuss the history of the Arachnida and Myriapoda section from 1990 to the present day – this date was chosen because it marked the introduction of modern staff arrangements and a change of department; and last, to detail all data sources available that relate to the collections. Of course, if each of these areas were discussed to any great length then they would merit a paper to themselves, so this article should be considered as a distillation of the most useful and interesting facts. Note: all images © NHM; all photographs by the author except Figs. 5 & 10.

### Early history

#### *Brief overview*

It would be very easy to go into great detail about the history of the Arachnida and Myriapoda collections; however, temptation has been resisted and only the key points in the early period of the development of the collections are detailed. Pocock's 1906 publication covers "the period that saw the big expeditions and explorations and the acquisition of many outstanding large private collections that are the foundation of taxonomic research" (Hyatt 1975, p. 7), so it is this primary source material which is referenced most extensively.

*Acquisition.* The NHM's history began with Sir Hans Sloane, a London physician and a very wealthy individual, who assembled the largest-ever collection of natural history specimens, coins, medals, books, manuscripts, and artifacts by an individual in Europe. After his death in 1753, Sloane's collection was bequeathed to King George II for the nation, on condition that his heirs were paid £20,000. This money was raised by national lottery and his vast array of natural history specimens (including arachnids) became the founder collections of the NHM. In the same year, the British Museum was founded through Act of Parliament and was sited at Montagu House on the site of the current British Museum in Bloomsbury (Stearn 1998).

There have been thousands of Arachnida and Myriapoda specimens acquired by the NHM since Sloane's time, and these will not all be mentioned here. However, many of the most important early collections are briefly touched upon (Table 1). Nearly all donated collections are incorporated into the main collection unless otherwise noted. From 1889 until 1904, the Arachnida & Myriapoda section received many specimens as gifts due to Reginald Innes Pocock's prolific naming of new species (Stearn 1998). By 1904, there were approximately 31,000 arachnids in the collection (Parker 1981). Since this period, there has been a steady stream of acquisition; the most recent are discussed below.

Other important Acari collections received included those from: K. H. Hyatt, C. D. Radford, J. E. Hull, C. F. George, C. D. Soar, W. Williamson, S. Mahunka, G. O. Evans, J. N. Halbert, C. Warburton, A. Fain, R. Husband, W. Till, and M. Hammer (Kethley 1979).

*Records and registers.* At the time of the British Museum's foundation, 5394 insect specimens were recorded as present in Sloane's collection (Stearn 1998). However, rather misleadingly, this number also included Arachnida

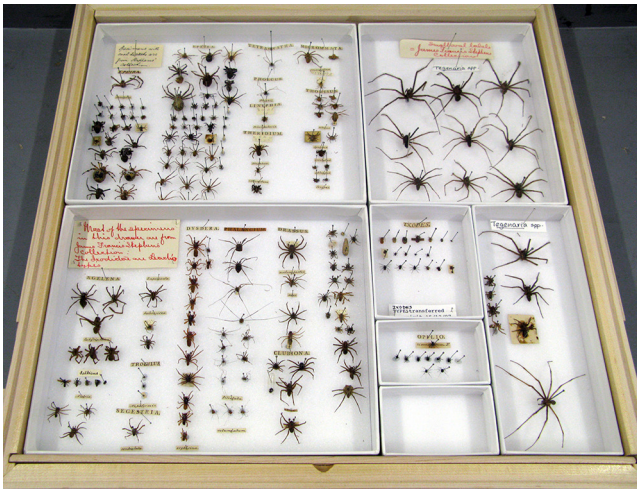


Fig. 1: The James Francis Stephens collection.



Fig. 2: The A. D. Michael collection.

Collector/ Expedition	Date(s) acquired/ registered	Contents	Comments	Reference
Leach	1826	Type and non-type material of Pseudoscorpiones and ticks, together with some dry, pinned specimens of Acari, Opiliones and Araneae		Pocock 1906a
Hardwicke	1835	Considerable numbers of specimens from India		Pocock 1906a
F. Walker	1835, 1850, 1851, 1854	British Arachnida and Myriapoda		Pocock 1906a,b
J. G. Children	1841	Dried Arachnida and Myriapoda from North America		Pocock 1906a,b
Blackwall	1851	39 dried spiders in their original glass tubes, with cork stoppers. All specimens identified to species	Purchased from Walker, kept separately	Pocock 1906a
J. F. Stephens	1853	Over 200 dried Arachnida pinned specimens, including several types, identified to species	Kept separately, but rehoused into modern collections drawer (Fig. 1)	Waterhouse 1906
Transit of Venus Expedition	1876	Arachnida and Myriapoda	Purchased from the Godeffroy Museum, Hamburg	Pocock 1906a,b
L. Koch	1881, 1882	Arachnid types from Australia		Pocock 1906a
Austin & Cambridge	1886	1500 arachnids and 800 myriapods from the Lower Amazon		Pocock 1906b
E. W. Oates	1889, 1897	1000 specimens of scorpions, Uropygi and spiders, mainly from Myanmar		Pocock 1906a
Keyserling	1890	Over 10,000 specimens of more than 2000 named species from Australia and America, with representatives of all orders except Acari and Ricinulei	Arguably the most important Victorian acquisition of Arachnida and Myriapoda; purchased from the Godeffroy Museum, Hamburg	Pocock 1906a
Godman & Salvin	1897, 1898	Central American arachnids and myriapods	First instalment	Pocock 1906a,b
Challenger Expedition	1903	Arachnids	Received from O. P.-Cambridge	Parker 1981
A. D. Michael	1926	2964 microscope slides and 64 tubes of Acari	An important collection containing material upon which he based his monographs; not integrated into main collection for historical reasons; remains in original housing of three glass-fronted portable cabinets (Fig. 2)	Baker & Colloff 2006
G. H. F. Nuttall	1939	Ticks of outstanding medical and taxonomic importance	Donated by the Moltano Institute, Cambridge; kept separately in the main collection cupboards	Hyatt 1975
Randell Jackson	1940s	British Arachnida and Myriapoda	Forms the basis of a separate British collection	Parker 1981
Yeoman & Walker	1967	Ticks from a survey of Tanzania	To be incorporated into main collection	

Table 1: Some of the most important early collections acquired by the Natural History Museum.

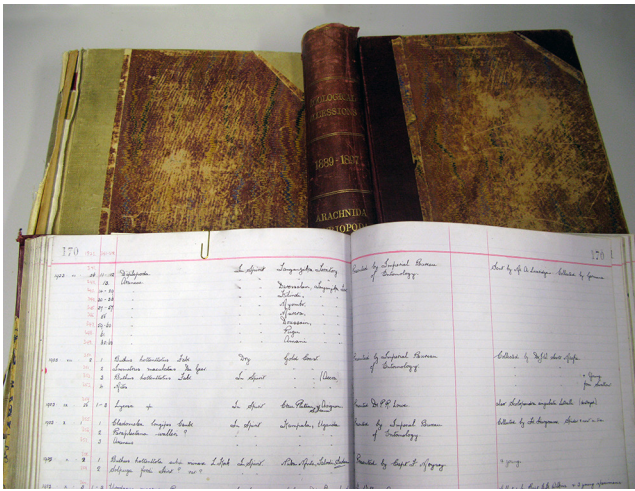


Fig. 3: Arachnida and Myriapoda accessions registers.

and Myriapoda, so there is no way to ascertain how many of these there actually were. Although Sloane had produced a catalogue of his collections, this only survives in part. Sloane's material is discussed below.

“There is no evidence that additions to the collection were registered and numbered before 1826” (Pocock 1906a, p. 655). In 1826, the first accession records were started, with Leach's donation of his collection (Pocock 1906b). Arachnida and Myriapoda specimens that were to be added to the collection (along with apterous insects) were entered into a handwritten accession register entitled ‘Catalogue of Aptera’ (Pocock 1906a).

In 1838, the dated registration of the Arthropoda began (Arachnida, Myriapoda, Crustacea, and Insecta) (Pocock 1906b). Accessions of Arachnida and Myriapoda, along with insects and Crustacea, were entered into dated ‘Annulosa’ registers, of which there are five. These are kept in the Entomology library. When added to the accessions register, all specimens were given a unique identifying number, which incorporated the year, month, and day of registration, and a consecutive specimen number. For example, the BM (British Museum) registration number of 85.6.1.13 translates to the 13th specimen registered on 1st June, 1885. Early Arachnida and Myriapoda BM numbers comprised only the year and consecutive specimen number, much like accessions numbers today.

In 1841, the first Myriapoda accession register was started (Pocock 1906b) and, in 1844, a preliminary list of myriapods was published. In 1856, a descriptive catalogue of the Chilopoda was produced (Pocock 1906b). In 1887, Pocock started a catalogue of all described species (Pocock 1906b). In 1889, the Arachnida and Myriapoda were entered into their own separate register (Fig. 3) (Pocock 1906b) and registers were continued until 1996 when computerized records took over. Modern specimen registration is discussed below.

*Collections housing, preservation and arrangement.* The earliest records that mention Arachnida and Myriapoda date from 1856. These state that dried Arachnida and Myriapoda collections were kept in the Insect Room. The Insect Room was a name that was used to describe the Entomology, Arachnida and Myriapoda collections and, rather strangely, the associated staff, which were all housed in a large room

with many collection cabinets (Stearn 1998). This name continued to be used even after the move to South Kensington, and only became obsolete after the formation of the Entomology Department (see below).

Between 1856 and around 1870, no-one worked on the Myriapoda collection but, around 1870, it is probable that the dried myriapods were arranged in cabinets (Pocock 1906b). The systematic study of the scorpion collection was started in 1889 (Pocock 1906a). Before 1890, little attention was paid to the spider collection (Pocock 1906a). The spirit material was mostly unsorted and unnamed until Reginald Innes Pocock joined the section in 1885, and he started work on the Mygalomorphae (Parker 1981). Work on the Araneomorphae was commenced in earnest from 1895 by F. O. Pickard-Cambridge in his capacity as a volunteer (Pocock 1906a; Parker 1981).

Until around 1870, the Arachnida collection consisted of poorly arranged, dry, pinned specimens in an old 40-drawer cabinet which, amazingly, still survives today and is currently standing empty in the Rowland Ward pavilion, and as microscope slides. The spirit collection at this time was almost non-existent (Pocock 1906a; Parker 1981). However, by 1886, the spirit collection had clearly begun to be developed, and it was arranged into sorted and unsorted specimens in one table case (Pocock 1906a). Indeed, it was at this time that the policy of preserving all specimens in spirit was introduced. Over time, the dry-pinned collection also increased in size and the specimens were additionally housed in glass-topped drawers with fixed-cork bottoms in 20-drawer wooden Hill cabinets. As time went on, the number of specimens preserved in alcohol totally surpassed that of the dry collection. The standard housing for the



Fig. 4: Traditionally curated Arachnida spirit collection.

spirit collection was hand-blown glass jars, with external labels handwritten in Indian ink and attached with animal glue (Fig. 4). The main part of the Arachnida collection is still housed in this way – a testament to the longevity of the methodology. Modern collections housing, preservation, and arrangements are discussed later.

*The move to South Kensington.* The natural history collections outgrew their housing in Bloomsbury, so they were eventually moved to the site in South Kensington, which opened to the public in 1881 as the British Museum (Natural History), or BM(NH) (Stearn 1998). The Insect Room, including its staff, was transferred to South Kensington in 1882–3 (Riley 1964). The Arachnida and Myriapoda collections were housed in a separate, purpose-built, fire-proof building for spirit collections, which was finished in 1883 (Hyatt 1974).

*A new spirit building.* A new spirit building, constructed of reinforced concrete, and located to the north-west of the Waterhouse building, was completed in three stages: 1921–1922, 1928–1930 and 1934–1935. Even though most of the NHM's spirit collections had been moved there by 1927, the original spirit building remained until its demolition in 1953 (NHM Library Archives Catalogue). The Arachnida and Myriapoda collections were housed in one large store room with a mezzanine floor, on open metal racking with wooden shelving (Fig. 5). The staff accommodation was in an office nearby, and later moved to a separate floor. Although the store room was purpose-built for spirit collections, the dry-pinned and microscope collections were stored alongside the spirit collection. The environmental conditions were not ideal: there was no temperature or humidity control, and there was a large air duct that opened directly to the outside of the building. Not only did this lead to the collection jars being covered with airborne pollutants, but it also facilitated a large-scale pest infestation of the dry, pinned collection! In addition, there were uncovered heating pipes across the ceiling which resulted in large fluctuations of temperature. At least there was low lighting, because there were no windows and the store room could be selectively illuminated.

*Formation of the Arachnida Section.* In 1913, “the entomological collections and staff, formerly known as the ‘Insect Room’ were then formally separated from the department of Zoology, of which they had hitherto been almost the largest section” (Stearn 1998, p. 205). Thus, the Entomology Department was born. The Arachnida and Myriapoda collections were left behind in the Zoology department. It was at this point that the Arachnida Section was formally set up and was renamed the Arachnida and Myriapoda Section, in 1932 (NHM Library Archives Catalogue).

### Historical collections

Many parts of the Entomology Department's collections are considered to be historic, but the line between historic and modern is somewhat blurred and is, by its very nature, rather subjective. Many years ago, senior management in the Department decided that only two collections would be officially labelled as the ‘historic collections’: those of Banks



Fig. 5: Arachnida and Myriapoda store room in the old spirit building.

and Sloane (the latter also contains specimens collected by Plukenet and Petiver). These were to be kept separate from the main collection in their original arrangement, in contrast to all other collections, which are always supposed to be incorporated. In practice, nearly all collections are incorporated, even such historic material as that collected by Alfred Russel Wallace and Charles Darwin, but there still remain a number of unincorporated historic collections, such as the Doubleday collection of Lepidoptera. Both the Banks and Sloane collections possess some Arachnida and Myriapoda specimens. These are dry-pinned and housed in wooden drawers in metal cabinets in a store room in phase 2 of the Darwin Centre. The historical collections have a dedicated curator who is responsible for them.

*Banks.* There is a modest number of Arachnida and Myriapoda specimens in the Banks collection. They are all dry-pinned, housed in one drawer, and nearly all identified to species. Numbers are as follows: two Ixodida, eight other Acari, one Amblypygi, 20 Araneae (including four possible types), eight Scorpiones (including one possible type), five Opiliones, four Diplopoda, and two Chilopoda. Some of the Arachnida types were described by Fabricius in *Systema Entomologica* (Pocock 1906a).

*Sloane (including Plukenet and Petiver).* The Plukenet material consists of spiders preserved herbarium-style: attached to paper sheets and bound in a volume along with insects. Due to conservation issues, it is currently not possible to open the volume in order to check numbers and other details. In the Petiver collection, there are just two spiders in sealed, glass-topped boxes in a drawer (Fig. 6). One spider has an illegible handwritten identification on the edge of the lid, whilst the other is not identified. Both have numbers in Roman numerals which link in with specimens listed in Sloane's original catalogue.

*Darwin.* Although Darwin insect material has been incorporated into the main collections, the Arachnida specimens

have not. Even though Darwin specimens are not classed within the historical collections remit, they are worthy of mention here. The Darwin arachnids are preserved both dried and in spirit. The dried material comprises nine specimens stuck on card points. They are all identified to species and have the registration number BM1885-119. They are in a new drawer, at the end of the dried spider collection, in a compactor unit in the same store room as the Banks and Sloane collections. The spirit material is housed in a store room in phase 1 of the Darwin Centre, and comprises four jars, two of which are the original ground-glass ones labelled 'Darwin's spiders'. One jar contains a spider type: *Epeira leucogramma* White, 1841. A study of Darwin's arachnids in the NHM is in preparation by Paul Hillyard.

*Potential future work.* Since no-one has worked on the Banks, Sloane, Plukenet, and Petiver Arachnida and Myriapoda material, future work is planned by the author to have the specimens imaged, their determination verified and a catalogue published.

*Type deposition* (pers.comm. P. D. Hillyard & K. H. Hyatt)

The following is a list of main authors who deposited some, most, or all of their types at the NHM before 1990 (the list is not exhaustive): E. Browning, A. G. Butler, D. J. Clark, O. F. Cook, G. O. Evans, S. Finnegan, P. Gervais, J. E. Gray, P. D. Hillyard, A. S. Hirst, A. M. Hughes, F. W. Hutton, K. H. Hyatt, E. Keyserling, C. L. Koch, L. Koch, W. E. Leach, G. Newport, F. O. Pickard-Cambridge, O.

Start Date	Leaving Date	Name	Speciality
1813	unknown	W. E. Leach	Myriapoda
1816	unknown	J. G. Children	unknown
1824	unknown	J. E. Gray	Myriapoda
1835	unknown	A. White	Myriapoda
1863	unknown	A. G. Butler	Myriapoda
1872	unknown	E. J. Miers	unknown
1885	1904	R. I. Pocock	Arachnida and Myriapoda
1904	unknown	W. T. Calman	unknown
1907	1927	A. S. Hirst	initially Arachnida and Myriapoda, then Acari
1911	1958	E. Browning	Arachnida and Myriapoda
1927	1936	S. Finnegan	mainly Acari (to follow Hirst)
1936	1940	R. J. Whittick	mainly ticks (to follow Finnegan)
1949	1989	K. H. Hyatt	Araneae, Acari
1951	1967	G. O. Evans	Acari
1958	1971	J. G. Sheals	Acari
1961	1971 (deceased)	D. J. Clark	Araneae
1968	1968	S. J. Moore	Arachnida
1968	1989	F. Wanless	Salticidae (Araneae)
1973	2006	P. D. Hillyard	Arachnida and Myriapoda
1975	to present	A. S. Baker	Acari

Table 2: Arachnida and Myriapoda staff in the Natural History Museum.



Fig. 6: Arachnida specimens in the Sloane (Petiver) collection.

Pickard-Cambridge, R. I. Pocock, H. de Saussure, T. Say, J. G. Sheals, F. Silvestri, E. Simon, A. Stuxberg, T. Thorell, C. Verhoeff, F. Wanless, R. J. Whittick, J. G. Wood.

The types of O. Pickard-Cambridge are mainly deposited at the NHM, with the rest in Oxford. A small percentage of Simon's types are in the NHM, whilst the rest are in Paris. Some of Thorell's types are in the NHM, whilst the remainder are in Genoa and Stockholm.

*Staff through time, up to 1989* (Pocock 1906a, Stearn 1998)

Not surprisingly, there have been a number of staff associated with the Arachnida and Myriapoda collections over time. As can be seen from Table 2, early staff members were all assigned to Myriapoda, and it was not until Pocock's appointment in 1889 that the Arachnida began to be developed.

Of course, through the years, there have been researchers who had long-term associations with the collections but who were never employed by the NHM nor had core funding, such as Winnie Till, D. A. Griffiths, and A. M. Hughes. The International Institute of Entomology (IIE) was based at the NHM until it moved to Silwood Park in 1998. It also had various staff who worked extensively on the NHM collections, such as Zhi-Qiang Zhang and Don Macfarlane. Specimens that were initially sent to the IIE were always offered to the NHM collections, and many of these were registered and incorporated. Other members of staff who worked at the NHM are C. D. Radford, Eira Hyatt, and Bernice Brewster.

## History from 1990 to the present day

### *Transfer to Entomology*

In April 1990, the Arachnida and Myriapoda collections were formally transferred from the Department of Zoology to the Department of Entomology. The collections remained in the same location in the Spirit Building and the staff complement was unaltered.



Fig. 7: Street view of DC1.

#### *A new Collections Management division and staff changes*

In 1990, a Collections Management division was set up in each science department within the NHM. This move was intended to place a greater emphasis on collections care and development across the Museum as a whole. Within the Department of Entomology there is a Head of Collections, supported by four Collections Managers and their teams of curators, who are responsible for the National Collections of insects, arachnids and myriapods. Each curator has responsibility for all or part of a large order (for example, Coleoptera), or a number of smaller orders (for example, orthopteroid insects). Much of the collections management effort is devoted to care and maintenance and active collection development, although Collections Management staff also make important contributions to the Department's research programmes. Conversely, research staff contribute to the care and development of the collections.

In 1997, the author was transferred to work on the Arachnida and Myriapoda collections as a dedicated curator. In 2006, Paul Hillyard retired, after a long and productive career. Unfortunately for the section, his post was not replaced, and it was transferred to elsewhere in the department – a hymenopterist was employed instead! This left the grand total of just two people on the section – the author, as sole curator, and Dr Anne Baker, the Acari researcher. In March 2007, Dr Greg Edgecombe (previously from The Australian Museum), was employed as a Chilopoda researcher. Unusually, his post is based in the Department of Palaeontology.

#### *A new building*

In the late 1990s, it was decided that the new Spirit Building no longer fulfilled Health and Safety regulations, so that a new collection storage facility was required to safeguard the Museum's collections stored in fluid preservatives.



Fig. 8: View of the Arachnida and Myriapoda store room in DC1.



Fig. 9: Inside a collections cupboard in DC1.

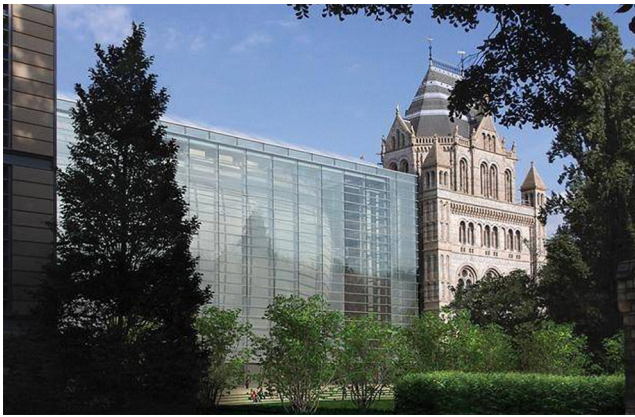


Fig. 10: Street view of DC2.

Provision of modern research and laboratory facilities was also needed. Additionally, there was a necessity to re-house many parts of the dry-pinned collections in the Department of Entomology, plus various collections in Botany. The NHM decided to construct a new building, which was named the Darwin Centre. It was to be built in two phases: the first phase (DC1) was to house all of the NHM's fluid-preserved collections (from the Zoology, Entomology and Botany departments). The second phase (DC2) was to house Entomology's dried, pinned specimens and microscope slides, along with Botany's collections of worldwide seed plants and the historic Linnaean and Sloane herbaria.

The foundations of DC1 were laid in summer 1999, only a few metres away from the Spirit Building. In 2001, the building was complete (Fig. 7) and the move of collections into DC1 began. In advance of the opening, the entire Arachnida and Myriapoda collections in spirit were transferred over a period of several months into robust plastic trays, with the help of two volunteers. As a result of all this preparation, and the team of Entomology curators who assisted, the actual move of collections from the old spirit building to DC1 took only two weeks to complete! The move to a new location provided the opportunity to consolidate different parts of the spirit collection that had been artificially separated in the old Spirit Building. Once all of the Spirit Building's collections had been moved, the old building was finally demolished in 2002.

The store rooms in DC1 provide optimum conditions for the wet collections (Fig. 8). The environment is temperature and humidity controlled (13–15°C; RH 45–55%; low lux levels), and there is a formaldehyde and ethanol detection warning system. The collections are housed on wooden shelving in tall metal cupboards (Fig. 9). The Arachnida and Myriapoda collections were retained in their plastic trays that were used for the move because this makes handling and storing the collections much more efficient. The Arachnida and Myriapoda microscope slide and dried, pinned collections were temporarily moved to the third floor of the Entomology building, thereby separating the different components of the collections. At this time, it was decided to transfer the king crabs (*Xiphosura*) to the care of the Department of Zoology, along with the lung worms (*Pentastomida*), which had also been in the care of the Arachnida and Myriapoda section.



Fig. 11: View of the Arachnida and Myriapoda store room in DC2.

In order to build DC2, it was necessary to demolish the old Entomology block first because DC2 was to be built partially across its footprint. The Entomology block had, therefore, to be emptied in readiness. So, part of the Arachnida and Myriapoda collections were on the move again. The microscope slide collection was taken to the NHM's off-site store in Wandsworth, whilst the dry, pinned collection was housed in the previous Origin of Species gallery in the Waterhouse building. The different components of the Arachnida and Myriapoda section had become even more divided. The entomology block was demolished in 2005 and in June 2006, the construction of DC2 began.

In August 2009, DC2 (Fig. 10) was completed and the microscope slides and dried specimens were moved into their final resting place – a store room (Fig. 11) with optimum conditions of 17°C, 55% (+/- 1%) RH, and low lux levels. The dry, pinned collection, together with the spider egg sacs and nests (Fig. 12), is stored in a compactor, and the microscope slide collection is stored in wooden cabinets (Fig. 13) along one wall. At long last, the Arachnida and Myriapoda collections were back in one building again!

### *Collections development*

*Curation.* Since 1990, basic curatorial work has continually been undertaken across all collections. Wet collection re-curation projects, which involved the rearrangement to current world catalogues, replacement of poor quality or damaged jars, replenishment of alcohol, computer-printed jar labels, tubing up of loose specimens, and updating of the collections database, have been completed for many specific



Fig. 12: Drawer of spider nests and egg sacs.

areas (Fig. 14). These include: Salticidae (Araneae) types; the Nuttall tick collection; Chilopoda; Diplopoda (Polyxenida, Glomeridesmida, Sphaerotheriida, Polyzonida, Siphonophorida, Playdesmida and Polydesmida); Opiliones; Mesothelae (Araneae), and the following Mygalomorphae families: Actinopodidae, Antrodiaetidae, Atypidae, Barychelidae, Ctenizidae, Cyrtacheniidae, Idiopidae, Mecicobothriidae, Migidae and Nemesiidae. Such work is planned in the future for the rest of the collection. In addition, the rearrangement of the non-Mygalomorphae Araneae collection to Platnick's World Spider Catalog (Platnick 2012) has been completed, along with the associated updating of the collections database.

Slide re-curation projects include: the complete re-curation of the Oribatida, Astigmata and the Mesostigmata collections, which involved rearrangement to current nomenclature, updating nomenclature on all slide labels, labelling slide drawers and cabinets, and updating the collections database. In addition, there has been the incorporation of several private collections, such as the F. A. Turk and A. M. Hughes collections. All dry, pinned specimens were removed from fixed, cork-bottomed drawers and transferred into Plastizote-lined unit trays which were placed into new wooden drawers (Fig. 15) in metal cabinets in a compactor unit. Since 2006, when the number of curators



Fig. 13: Drawer of Acari microscope slides.

on the section was reduced to a meagre one, volunteers have been particularly welcomed to assist with many curatorial tasks, and their help is greatly appreciated!

*Use of the collections in worldwide research.* As stated in the introduction, the Arachnida and Myriapoda collections are of worldwide scientific importance. They are made available for study to all *bona fide* researchers around the world. The collections are constantly being developed through loans, visiting researchers, and arachnid groups. There has been an increased move to send out unidentified specimens on loan to specialists, in order to have them identified. Likewise, visiting researchers are encouraged to identify material during their stay, and they often update the out of date nomenclature of the specimens in their area of expertise. Over the last few years, expert members of arachnid groups, e.g. the British Tarantula Society (BTS) and the British Arachnological Society (BAS), have been encouraged to work on NHM material, and this has resulted in a large number of specimens being identified too.

*Use of the collections in publications.* A great many specimens from the Arachnida and Myriapoda collections have been utilized in publications in recent years. Many of these are taxonomic papers, but several are catalogues of areas of the collection; for example, *A catalogue of the type specimens of Ixodida (Acari: Argasidae, Ixodidae) deposited in The Natural History Museum* (Keirans & Hillyard 2001), and *Catalogue of the pseudoscorpion types in the Natural History Museum* (Judson 1997). Such work is continuing; for example, the author and Professor Adriano Kury are shortly planning to produce a catalogue on the Opiliones types at the NHM.

*Additions to the collections.* Since 1990, there has been a steady stream of donations. One of the most notable in this time period was that of the Acari microscope slide collection of F. A. Turk, donated by Mrs Stella Turk in 2000. It comprises 1250 slides. The most recently received large donations include the Elaine Robson, the Paul Selden, and the Helen Read collections. The Elaine Robson Onychophora collection, received in 2008, consists of approximately 1000 specimens in alcohol and as cross-sections on microscope slides. The Paul Selden collection, received in 2009, consists of 2148 tubes of specimens (mainly spiders, but some other arachnid orders, plus a few myriapods) from around the world. There are around 780 species of which 1 genus and 176 species are new to the NHM collection. The Helen Read collection, received in 2011, consists of 384 tubes of arachnids and myriapods from Europe, which represent 179 species.

Recently, exchanges with other institutions have been developed. This has resulted in the NHM receiving numerous species of spiders new to the collection from Dr G. B. Edwards from the Florida State Collection of Arthropods. This is only the first in a series of planned exchanges with this institution, and exchanges with other institutions are additionally underway.

#### Data sources relating to the collections

There are several diverse forms of indexes and registers directly relating to the collections, which have always





Fig. 14: Modern housing for the spirit collection.

been housed and used on the section. These are: accessions registers, collections indexes in files and notebooks, and card indexes. More recently, indexes to the collections were computerized and developed. Any documentation which was not used regularly on the section was transferred to the NHM Archives. There is also a very large reprint collection. All these areas are discussed under the appropriate subheadings.

*Accessions registers.* As mentioned on p. 305, a separate handwritten Arachnida and Myriapoda accessions register was started in 1889. Seven were produced in total, up to 1996, when an electronic version was introduced. The Annulosa, and the Arachnida and Myriapoda registers detail: BM registration number; number of specimens; order, genus and species where known; locality (often just the country); collector and donor, and origin from private collection. There are also three handwritten catalogues of ticks collected by G. H. F. Nuttall, which cover the years 1879 to 1935, and list every batch of species collected, their host, locality data, and unique batch numbers from 1–3972. In 2010, the seven Arachnida and Myriapoda registers and the three catalogues of ticks were digitized and transcribed. These are available on the NHM Intranet.

*Collections indexes in files and notebooks.* There are four typewritten spirit collection indexes in lever-arch files which were compiled around 1914–1918 by Hirst. Later annotations were made mainly by Browning, with some by Hyatt until the late 1950s. Two volumes cover Araneae, one volume Chilopoda, Symphyla, Pauropoda and Diplopoda, and one volume covers scorpions, pseudoscorpions and Opiliones. These indexes detail genus, species, author, locality, type status, and location in the collection.



Fig. 15: Modern housing for the dried arachnid collection.

Subsequent handwritten annotations indicate additional species, cross-referencing to other taxa, and synonymies. These have all been digitized and transcribed. There is one computer-printed spirit collection index in a ring binder, compiled in 1994 by Paul Hillyard, which covers all the Arachnida and Myriapoda. It details family, genus, series number, and location in collection. There is a handwritten index in a small notebook to the dry and spirit collections. This details the genus and collecting locality of Scorpiones, Pedipalpi, and Araneae in the dry collection, and the genus and collection locality of Scorpiones, Pedipalpi, and Solifugae in the spirit collection. There is one handwritten index in a ring binder, compiled around 1914–1918, possibly by Hirst. This details genus, species, author, locality, and location. The orders covered are: Pedipalpi, Araneae, Scorpiones, Onychophora, Myriapoda, Solifugae, Opiliones, ticks, Pseudoscorpiones (localities of British Pseudoscorpiones in the NHM collection), and Koch Arachnida and Myriapoda species.

*Card indexes.* There are three types of card index: a zoological record index, a collections index, and an incoming collections index. All three were, in general, kept up to date until around 1976–7. The zoological record cards are arranged by species in alphabetical order, and by genera in alphabetical order. They cover Acari, Chilopoda, Diplopoda, Araneae, Scorpiones, Pedipalpi, Solifugae, and Pseudoscorpiones. They detail genus, species, author, locality, donor, type status, registration number, reference, and host (if Acari). The collections index is for Acari only, and is arranged by species. It details genus, species, author, locality, donor, type status, registration number, reference, and host. In addition, there is a collections index to Nuttall material, and this is arranged by genera. It details genus, species, author, locality, type status, registration number, and host. The incoming collections index is arranged by donor, expedition or collector name. It details donor/expedition/collector name, order, locality, any other data, date received, and the part of the collection to which the specimens were added.

*Reprints.* There is a good collection of reprints (separata) on Arachnida and Myriapoda. Loose reprints are housed in box files, separated into orders and then in alphabetical order by author name. There are 76 boxes of Araneae, 32

on Myriapoda, three on Onychophora, nine on Opiliones, one on Palpigradi, two on Pedipalpi, seven on Pseudoscorpiones, one on Ricinulei, nine on Scorpiones, two on Solifugae, and 30 on ticks. Also, there is one box on venomous spiders, one on venomous scorpions, 16 boxes of general reprints, and two boxes of reprints on fossils. These are all currently housed in the old Origins gallery, which was converted into a temporary work and storage area for the Coleoptera and Hemiptera collections with associated staff. There are 141 boxes of Acari reprints which are housed on the seventh floor, north end of DC2. In addition, there are many bound reprints, and these are kept in the sectional bookcases arranged by author name.

*Archives.* The Archive material is rather diverse. It includes the correspondence of successive heads of the Arachnida Section; covers the acquisition, loan and exchange of specimens; enquiries from amateur and professional zoologists; the correspondence, notes, research papers and catalogues compiled by members of the Invertebrate Section of the Zoology Department; together with the correspondence collection of Reginald Innes Pocock. Details of this collection can be accessed through the NHM's Intranet.

*Computer databases.* In the 1970s, there was an attempt to computerize the collection using a system of index numbers, e.g. 1972/123. The exercise was discontinued, however, before completion. In 1996, an electronic accessions register was set up in Paradox (part of the NHM's Collections Management System) which superseded the handwritten registers. The completion of a species-level computerized index for all Arachnida and Myriapoda orders was completed at the end of 2003. This detailed order, superfamily, family, genus, species, author, date, presence of type holdings, and location in the collection. The Chilopoda, Salticidae types (Araneae) and Theridiidae (Araneae) were additionally databased to specimen level.

In January 2007, a much more sophisticated Collection Management System (CMS) was introduced into the Entomology department, having been introduced into the Zoology department and other parts of the NHM previously. This is called EMu (Electronic Museum) and is run by the company KE Software. EMu is used in many institutions in several countries around the world, e.g. UK, Egypt, Qatar, North America, and Australia. All Paradox data was migrated into EMu. Since migration, collections locations have been updated for almost all Arachnida and Myriapoda orders, and numbers of types have been added. EMu is a powerful CMS, having a flexible reporting mechanism to output data in a variety of formats e.g. Excel spreadsheet. Reports can be filtered on specific criteria e.g. to show records for a particular author, type status, family, or any combination of criteria. The Arachnida and Myriapoda database can be accessed externally on the NHM Internet.

## Conclusions

It is sincerely hoped that the information contained within this article will provide a useful resource for the collections as a whole for potential researchers, such as scientists and historians, and that, as a result, they will regard the collections with even more passion and enthusiasm.

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