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Title: The Darwin Centre development: Before, during and after, at the Natural History Museum, London

Author(s): Brown, P. A.

Source: Brown, P. A. (2010). The Darwin Centre development: Before, during and after, at the Natural History Museum, London. *NatSCA News, Issue 20*, 45 - 57.

URL: <http://www.natsca.org/article/1373>

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The Darwin Centre development: Before, during and after, at the Natural History Museum, London

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Introduction

This is the story as told by an Entomology curator who works at the Natural History Museum in London and has seen many changes there over the last few decades. I have been a resident of the Old Entomology Block, the ex Waterhouse 'Origins Gallery' and now the new second phase of the Darwin Centre and I have witnessed the end of the Old Entomology and Zoology Spirit Buildings, the rise from the ashes of the new Darwin Centre and all the moves of Zoology, Entomology and Botany specimens and staff. The site of the Natural History Museum in South Kensington has always been short of space, constrained by the original, and now listed, Waterhouse Building finished in 1881. There have been many plans and some actual builds behind the World famous 205 metre long Waterhouse frontage, to try and improve collections storage and research facilities.

Old Buildings: The Zoology Spirit Building

The 'New' Spirit Building was built in three parts; between 1921–1922; 1928–1929, and another extension added 1934–1935, being built of Ferro-concrete, 250 feet long and 54 feet wide. It was initially planned to house Entomology collections here but the plans changed to ultimately house the Zoology Department's extensive spirit collections (Fig. 1). Some of the Zoology collections were moved in 1924 into the first, western part to be built, with Entomology temporarily using the extended space in 1930. The fish and Arachnids collections moved in 1938 from the old and cramped 'Gunthur' Spirit Building (1883–1953) on the site of the present Boiler House, after Entomology moved into their 'new' Entomology Block in 1937 (see below). The initially 'open plan' new Spirit Building of five floors was compartmentalised after the Entomology collections left, into smaller 'fire proof' units behind heavy metal doors throughout the building. Mezzanine floors were inserted in each floor on the storeroom side and a sprinkler valve fire protection system was fitted throughout. The south wall windows were blocked in to reduce heat build up from the sun and offices were inserted along the North side with the original windows kept intact. These windows overlooked the old 'Discovery' huts, built to house the extensive collections made during the HMS Discovery expeditions between 1925–1935 (Fig. 1). However, environmental conditions were difficult to control with ambient temperatures especially on the fourth floor rising to 37° C in summer, which sometimes caused the alcohol to expand and push off the spirit jar tops, and winter temperatures plummeting to 11° C. The smell of ethyl alcohol and formalin was ever present and on occasion would be even noticeable by our close neighbours in Queen's Gate! (Portela Miguez, 2006)

Old Buildings: The Entomology Block

The Entomology Block (Fig. 1) was built to house our expanding insect collections which had outgrown the Waterhouse basement South West corridor, even with mezzanine floors inserted (now the home to the Museum's Mollusca collections). The cramped conditions were highlighted when two Trustees, a Prime Minister and an ex-Prime Minister on a tour of inspection, became wedged in a narrow passage between cabinets and work tables and they readily agreed that things had become intolerable. The build was in two phases, starting in 1934–1936 and the second half started in 1938. The 2nd stage was interrupted by WW2 and left standing as a rusting maze of steel girders until 1950 when work resumed with final completion in 1952 (Riley, N.D., 1964). The completed Entomology Block consisted of six floors of reinforced concrete faced with London brick, with many windows, both on east and west faces allowing in plenty of light. This provided 67,200 square feet of new space but, initially and to the great disappointment of the Entomology Department, we had to share the building with the bird section on the lower three floors, the space only being released to us when Ornithology moved to their purpose built facility at our Museum at Tring (1971–1972). Along most of the east side, there were offices for senior staff and along the west side were bays made from assorted and often antique furniture for the junior curators and assistants. The east side office views overlooked the Waterhouse Building and to the west, we overlooked the gardens, which became the wildlife

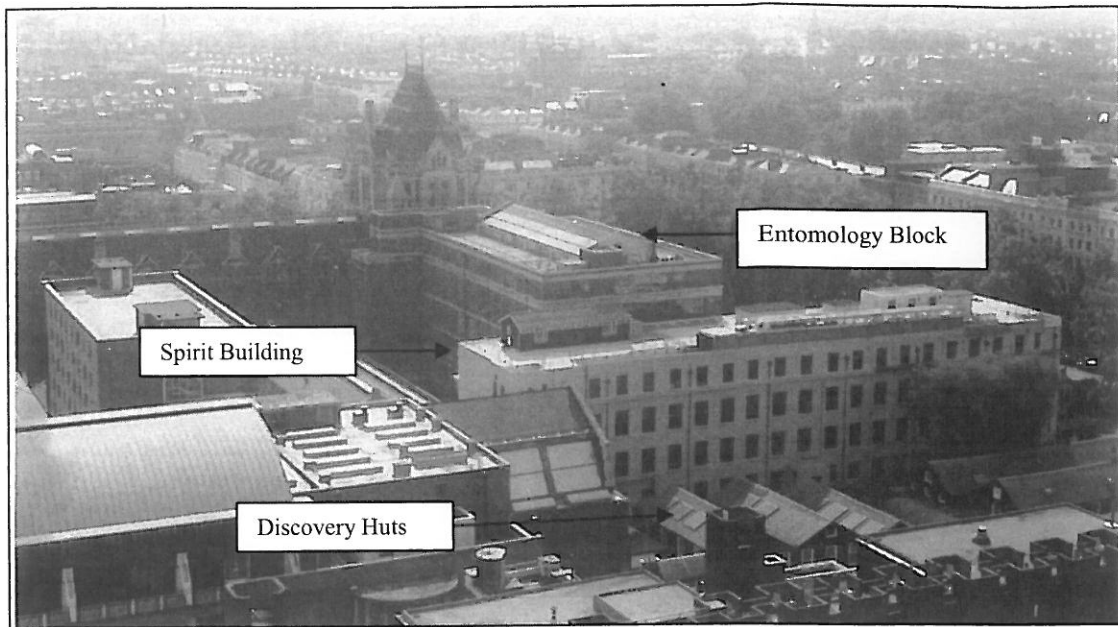


Fig 1. The Zoology Spirit Building (centre right), with the Entomology Block behind (centre) and discovery huts (right foreground) R.I.P! Photo taken from the Imperial College Bell Tower.

garden latterly, and panoramic views over west London. The space the birds vacated was filled with the huge Rothschild Lepidoptera collection from Tring. The cabinets in which the Entomology collections were housed, included initially 2000 old and original tropical hardwood carcasses and more recently acquired replacement chipboard and Balmforth & Stortech metal cabinets (in duck-egg blue/green) in static rows throughout most of the central area of each floor. The final arrangement of collections after many moves were as follows: fourth floor housed Hemiptera, Orthoptera & 'small orders' and the Keeper's office; the third floor held the Hymenoptera and the Entomology Library; the second floor housed the Coleoptera; the first floor part Diptera; and with the Lepidoptera on the first, ground and basement floors. In more recent years, specialist laboratories were developed within the 'Entomology block' for electrophoresis and DNA studies, microscope slide making, Diptera work and soil sample sorting. We also had labs built on the roof of the old Zoology Spirit Building for controlled environment aphid, coccid and parasitic Hymenoptera live culture rearing, a greenhouse for growing plants for the aphid cultures (since donated to the wildlife garden) and a sound proofed, audio laboratory to record Orthoptera songs.

The Entomology Block was not particularly attractive or fit for the purpose of insect collection storage, being prone to variable environmental conditions and occasional rainwater leaks. The variable quality of the cabinets and drawers and the many inaccessible dust pockets within the building, meant that there were endemic pest problems which were controlled by the use of (now illegal) insecticides. The smell of the cocktail of benzene, creosote, naphthalene and para-dichlorobenzene used to treat the insect drawers against pest attack, pervaded the whole building and staff! For a number of years there were discussions about moving our collections to better custom built accommodation elsewhere in England but this was shelved. Further discussions to replace the Spirit Building and the Entomology Block with new better designed structures on site, primarily to introduce proper environmentally controlled collections stores, to increase the space for modern research and to showcase our science to the public, proceeded and were agreed. We went out to tender and winning designs were chosen which were deemed iconic enough to attract as wide a number of patrons to help fund the 'Darwin' Centre.

New Buildings: First Phase of the Darwin Centre

Initially we built the first phase of the Darwin Centre (Fig. 2), to house the life sciences (Zoology, Botany and Entomology) spirit collections, to the north of the Zoology Spirit Building. This space was cleared by demolition of the 'Discovery' huts and the removal of a row of large black poplar (*Populus nigra* var. *betulifolia*) trees. The first phase was designed by HOK International with the remit that the risk of fire should be, as far as possible, designed out and was completed by November 2001 (Fig. 2). The first phase consists of seven floors of offices and laboratories along the south side with a central ground to roof atrium

(Fig. 4) and the windowless and environmentally controlled spirit storage along the north side. Time lapse doors to the store were fitted and a monitoring system for atmospheric alcohol levels was put in place and a pumped spirit supply system was plumbed into the building. New metal cabinets with wooden shelving were fitted into the spirit store areas and the contents of the Spirit Building were moved directly across into the new building through a direct link bridge cut through the Spirit Building wall and in via the new main entrance. The move was carried out by Zoology Department staff from February to October 2001 and involved 22 million specimens. Smaller specimens in 450,000 jars varying in volume from 10 ml to 100 litres remained in their jars and many much larger items were moved into variously sized tanks (Fig. 3), followed by the staff by January 2002. The building opened to the public on 30th September and officially opened by Her Majesty Queen Elizabeth on 22nd October 2002.



Fig. 2. Darwin Centre Phase 1 from Queens Gate.



Fig. 3. A new spirit store room with open racking and vented tanks (photo from O. Crimmen).

Once the Spirit Building was clear, the demolition contractors moved in and encased the building in scaffolding (Fig. 5). A large crane was employed to hoist a number of hydraulic caterpillar tracked 'dinosaur like' jaw and 'driller' cranes which were placed onto the roof. Holes were punched through each floor and out of the south wall, to allow demolished rubble to fall and be loaded into trucks. We, in the Old Entomology Block, watched the slow process of demolition floor by floor and the levelling of the site, which was finally covered with a veritable Chesil Beach of pebbles to hide the remnant foundations. Many small pieces of the rubble were taken as keep-sakes by previous denizens. A temporary raised and enclosed walkway was erected to allow public access to the DC1 atrium at Ground floor level. The atrium has glass fronted display cabinets for spirit jars containing impressive specimens, and windows allow views into the ground floor store. This link from the main Museum Waterhouse Building through to the first phase was closed and removed with the start of the building of DC2.



Fig. 4. The DC1 central atrium.



Fig 5. Demolition of the Zoology Spirit Building.

Temporary Accommodation for the Entomology 'Decant'

Then it was the turn of the Entomology Block to be emptied and demolished but the second phase of the Darwin Centre was planned to use the same footprint as the old building. We had to empty the Entomology Block of at least 28 million specimens in 139,000 drawers and store boxes and move the collections to a number of temporary localities. The Darwin Centre move represented the largest move the Natural History Museum had undertaken since the move from The British Museum in 1882. This would mean the geographic fragmentation of the Entomology Department.

The 'Origin of Species' gallery in the Waterhouse Building was emptied of exhibits and made available for collections storage. A free standing mezzanine floor was inserted (so that the internal terracotta fabric would not be damaged) for staff accommodation above the temporary collections storage below with small 'dumb-waiter' lifts up to the mezzanine level. The Entomology 'Decant' moves started on Monday 16th May, 2005. We used our existing Hill, chipboard and metal cabinets here and moved the Coleoptera, Orthopteroid, Neuropteroid, Trichoptera, Heteroptera and Homoptera: Auchenorrhyncha collections into this space. The mezzanine floor was furnished for staff with some new cubicle units and a lot of the old and historic Entomology Block furniture (Fig.6), including glass fronted bookcases which had housed the Entomology Library. We also cleared the Rowland Ward pavilion of the African dioramas of mounted giraffe

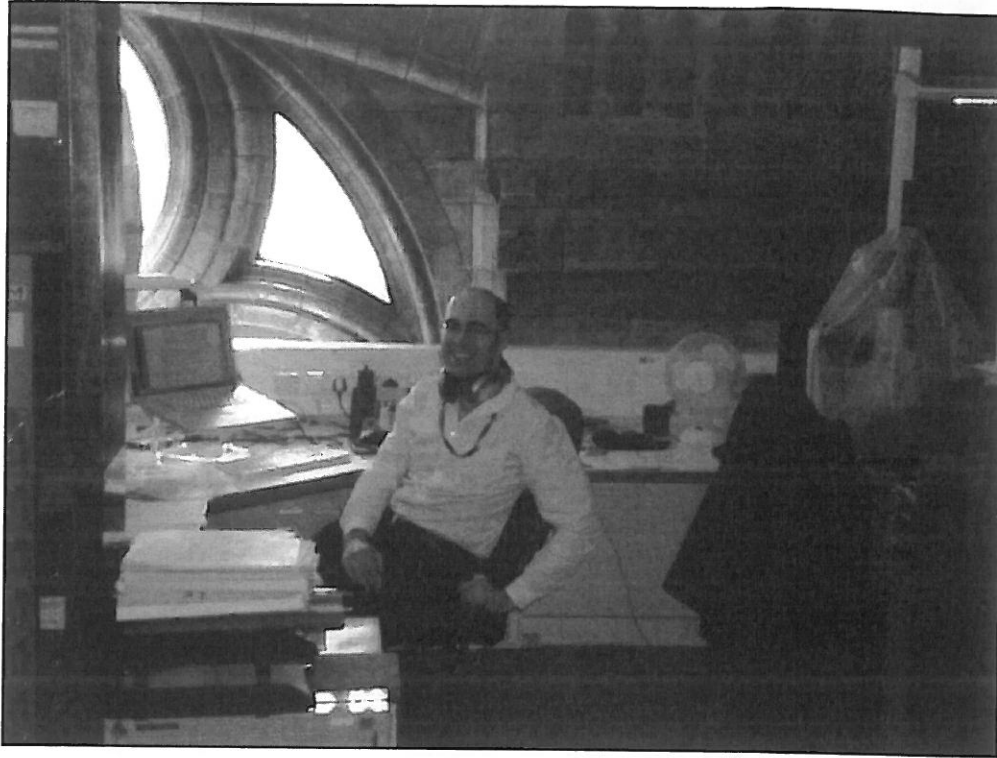


Fig. 6. Dr Vince Smith's 'temporary' bay on the Origins gallery mezzanine, photo courtesy of Ed Baker.

(*Giraffa camelopardalis*), okapi (*Okapia johnstoni*) and sable antelope (*Hippotragus niger*) specimens and used this space to house the Diptera collections (Fig. 7). Much of the Hymenoptera collection was moved to the windowless Spencer Gallery in the Waterhouse Building, previously available for corporate functions with valuable and very large paintings of rare and extinct birds. Incidentally, now that the move into the new building is complete, this space will be return as the Museum's new Images of Nature gallery showcasing the highlights from the Museum's natural history art collection. The British Gallery on the 2nd floor of

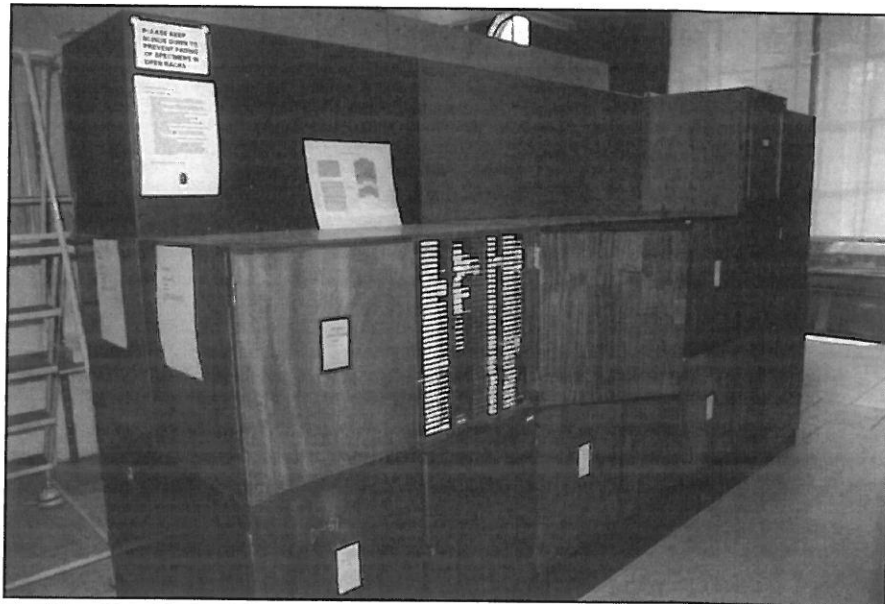


Fig. 7. Old 'Hill' Horizontal Diptera microscope slide cabinets in Rowland Ward Pavilion, once home to the Rowland Ward Giraffe, Okapi & Sable Antelope mounts.

the Waterhouse East wing above the Cryptogamic herbarium was emptied of its dioramas and temporary offices were built to house the Entomology Keeper's office staff, management and Trichoptera staff. Our packing room for incoming and outgoing loans was moved to the basement under the Waterhouse front 'Twin Towers'.

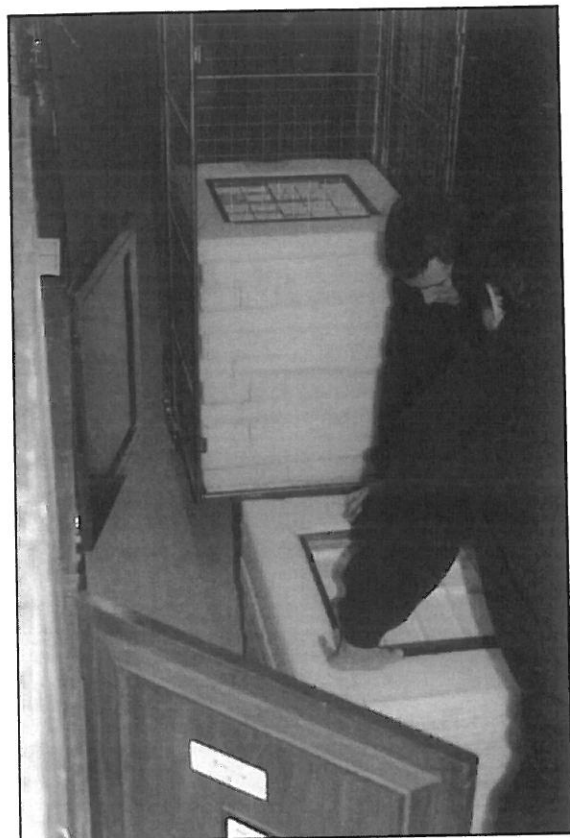


Fig. 8. Nexus loading insect drawers into pads and cages for removal



Fig 9. A Nexus lorry load of insect collection cages at the South London Store.



Fig 10. Mark Pearson of Nexus moving our card index files.

The windowless Oberthür room in the basement of Waterhouse (next to 'Zoology Store Room 1') was emptied of stored furniture and became our temporary store for sectional reprint collections and the Rothschild Flea and Diptera microscope slide collections. This room once housed the Charles Oberthür Lepidoptera collection and later became the setting room in the 1950s where junior staff set mostly Lepidoptera specimens. This room then had a bad reputation for pest problems. Ironically our quarantine and other freezers were latterly moved here too. We moved our DNA laboratory to the Seal Basement, under the Mammal Tower, and our Diptera culture and soil extraction labs moved into space vacated by Vaughan Southgate's biomedical parasitology section in the South West Tower of the Waterhouse Building, although permanent office and storage usage for this area was not permissible due to fire loading restrictions and lack of a lift. Our Diptera preparation and lacustrine deposits laboratory was moved to a vacant laboratory in the Palaeontology wing and renamed the Hall-Brooks Lab.

We also used the Museum's South London storage facility for our largest Entomology collection, the Lepidoptera, and the Hymenoptera: parasitica, the Homoptera: Sternorrhyncha, Psocoptera, Thysanoptera, Collembola and Phthiraptera microscope slide collections. Space was vacated by other Museum departments to allow us space in two windowless floors with environmental control. Link 51 were contracted to put in roller-racking compactors ready to take the old collection cabinets. The associated staff were housed on three floors of the office Block next door with the Entomology Library which was the first unit to move in June 2005. We had a very useful undercover loading bay in the basement, although unfortunately this area suffered from back flooding from the drains on occasion. Many of our staff who lived in South London had an easier commute and many were happy with the relaxed atmosphere of the storage facility. All these moves were done quickly and efficiently by Nexus Ltd (who specialise in moving Museum collections) and to move the many thousands of drawers in their correct order, we used 450 wheeled supermarket style cages with polyethylene foam insert pads cut to fit the three main drawer sizes involved, the 'Hill main' drawer, the 'accession' and the Rothschild & Rhopalocera drawers (20 drawers per cage) (Figs. 8, 9, 10). After initial briefing as to the delicate nature of our specimens within the drawers, the Nexus staff were very professional and efficient in moving the drawers for us under close curatorial supervision. Many lorry loads went to South London from South Kensington with a member of our staff 'riding shotgun' to ensure that the specimens came to no harm en route. In order to load the lorries in the Queens gate car park, we pushed out a window in the Entomology Block basement and put in a small external lift to ease loading drawers and cabinets going out to the South London Store. Only a few accidents occurred, with the potentially catastrophic fall of a fully loaded cage from a lorry tailgate only dislodging two specimens without damage within the 20 full drawers which showed how effective the cage/pad system is!

New Buildings: The Second Phase of the Darwin Centre

The move out of the Entomology Block was completed by November 2005 and Heery International Ltd immediately started demolition and, as with the Spirit Building, this was a slow and noisy process, finished by March 2006. The building was well built and had survived a number of near bomb blasts during WW2, so hammer drills had to be used on occasion to dismantle the harder bits. A funding campaign was started in autumn 2004 and phase two of the Darwin Centre plans by Danish architects C.F. Møller were finalised and the main contractor, HBG Construction, was appointed in August 2005, who started construction work in June 2006. The footprint for the second phase building varied slightly from the Entomology Block. It included the workshop courtyard that existed between the Entomology Block and the Spencer Gallery wall of the Waterhouse Building. It is also further back from Queens Gate in line with the west end of the Waterhouse facade, so as to impact less on the view of the 'listed status' Waterhouse Building frontage of the Museum. Also, we could not build above the roof line of the Waterhouse frontage for similar reasons. The second phase building consists of a reinforced concrete and glass faced atrium with an insulated sprayed concrete cocoon, faced with Venetian plaster inside and supported on piled foundations. The west façade glazing and roof are supported on steel columns and beams. The cocoon concrete also acts as part of the structural frame. Flooring includes limestone in the public areas and vinyl in the science areas. Glass fronted offices are at both North and South ends to house up to 250 staff. The cocoon is, at 65-metre-long and eight storeys high (Fig. 11), the largest sprayed concrete structure in Europe. Our first occupant was a red fox (*Vulpes vulpes*) which took up residence for a few days and left of its own accord after attempts were made to 'rescue' it and it now lives somewhere in the Museum's wildlife garden.

Part of the Darwin Centre second phase funding covered the manufacture and fitting out of compactor units and new collections furniture within the cocoon stores. The compactors were made and fitted by Rackline and the cabinet job went to tender. After much discussion with the companies short listed, we decided to

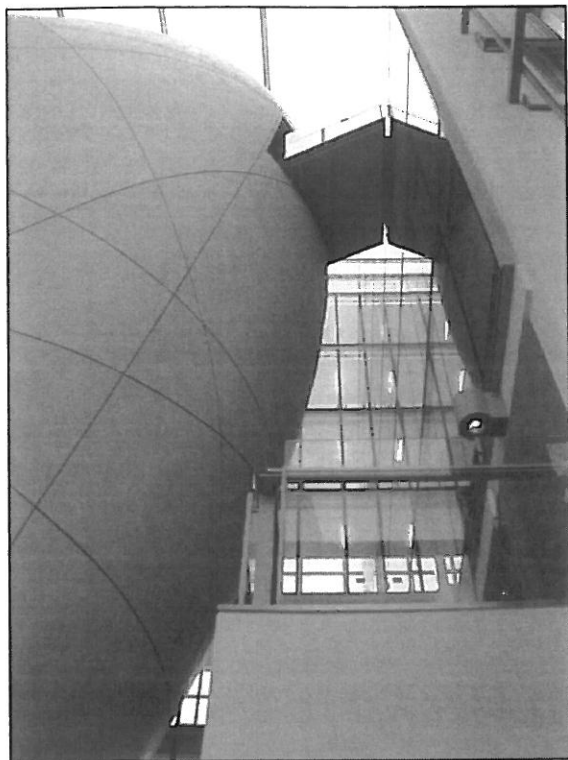


Fig. 11. DC2 cocoon looking up from the public atrium.

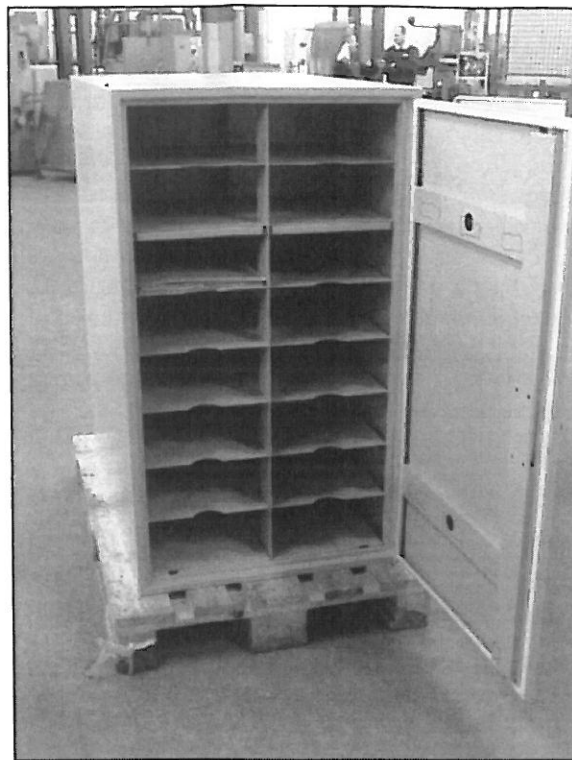


Fig. 12. Sheetmetal Ltd Botany cabinet. Photo by C & D.

use C & D Sheet Metals Ltd of Belvedere, Kent who gave us a cheaper, lighter yet stronger double backed design involving the welding of two 'U' shaped steel sections longitudinally. We have three sizes of Entomology cabinets to fit our 'main collection Hill', our 'accession moth box and our Rothschild & Rhopalocera drawers. The Botany cabinets with herbarium sized compartments look on the outside, very similar to our Entomology cabinets (Fig. 12). All the new cabinets were manufactured on computerised metal folding machinery so that the cabinets are the same throughout without the little variations one gets with individually made cabinets. A standard pale grey was chosen as our corporate cabinet colour for both Botany and Entomology collections (Fig. 13). An environmental monitoring system by Eltec was installed throughout DC2, in the cocoon and within cabinets with a controlled relative humidity of 45-55% and a temperature of 17°-18° Centigrade. This system is maintained and monitored by our Conservation Group and the Palaeontology Conservation Unit.

The Entomology 'Migration'

On completion of the second phase, we employed Nexus Ltd again to 'migrate' (as opposed to 'decant') the Botany collections for the first and only time and the Entomology collections for a second time (Fig. 14). First to move in were the DNA laboratory into the 6th floor with new lab furniture by Waldner Ltd and our imaging Sackler Biological Imaging laboratory into the 5th floor. The old seal basement has now been developed as the Wolfson Wellcome Biomedical Laboratories.

The decision was made to move the flowering plant collections and staff from Botany into the second phase so that not all the Entomology collections have moved over to the new building. The Coleoptera and Hemiptera pinned collections were left in the Origins Gallery with the Hemiptera: Sternorrhyncha microscope slide collections moving from the South London store facility into the space vacated by the Orthopteroids, Neuropteroids, Trichoptera & Odonata. Entomology has now occupied the 2nd floor with Diptera and Lepidoptera, 3rd floor with Hymenoptera and Lepidoptera again and the Phthiraptera, Thysanoptera and Collembola microscope slides and the 7th floor with Orthopteroids, Neuropteroids, Trichoptera, Odonata etc. Lepidoptera is also stored on the Ground floor and on the Lower ground floor where we also have both the Botany and Entomology British collections.

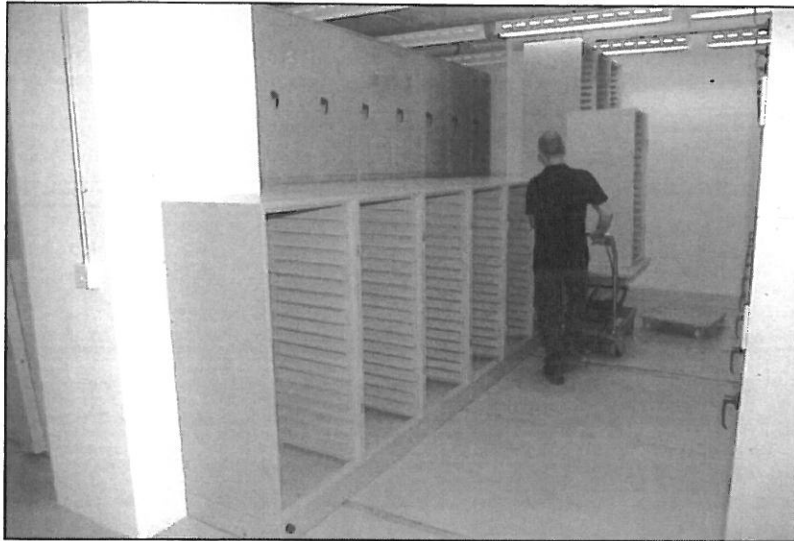


Fig. 13. Fitting out the Compactor units with new C & D Sheet metal Ltd insect cabinets in the Cocoon.

We moved the last of the specimens out from the South London Store on Friday 18th December 2009, thus completing the move which Nexus has again done exceedingly well for us. At present, we have left behind the Entomology Library which remains there and we continue to maintain a twice daily hybrid fuelled car shuttle service link with the Library.

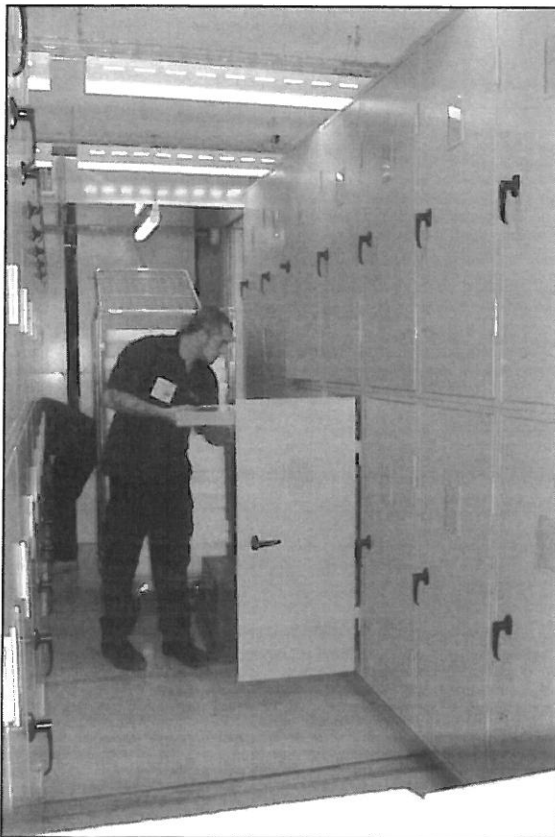


Fig. 14. Nexus putting insect collection into the new cabinets in DC2 cocoon.



Fig. 15. John Hunnex of Botany Dept removing the last cage of Frozen Botany specimens.

The Botany 'Migration'

The Botany general and European herbaria were moved from the 2nd floor west Waterhouse herbarium using smaller sized cages than the Entomology ones, with green corex tray inserts into which the herbarium folders were placed. The full cages were then taken down through the public areas of the Museum to be systematically frozen down to -30°C as part of the move, inside three Maersk 40 ft 'Magnum' freezer containers sited in the Museum's car park (Fig. 16). Maersk donated the freezers free of charge with Darwin Centre funding covering the cost of transport. There was an endemic, if low population of *Stegobium paniceum* beetles within the sheeted herbarium collection so freezing was required to remove the threat to collections in the new building. The Entomology collections were inspected drawer by drawer and any *Anthrenus / Reesa* infested drawers, of which there were very few, were frozen separately. These herbarium collections now occupy the Lower Ground, 4th and 5th floors of DC2. The last cage of European Herbarium sheets were moved from the freezer by John Hunnex on 23rd February, 2010 which represented the end of the main 'Migration' into DC2 (Fig. 15).



Fig. 16. Maersk 'Magnum' Freezers in situ in the Exhibition Road car park.

Life in the Darwin Centre

Entering the Cromwell Road museum entrance and turning left along past the dinosaur gallery, one soon sees the Cocoon ahead and light from the wildlife garden streams into the Waterhouse gallery from the extensive glass front and transparent roof of the new building. When it rains, the sound on the roofs resounds throughout much of the Darwin Centre. In the second phase, we now work in air conditioned, open plan cubicles with modern Godfrey Syrett furniture in a restful grey and blue combination with spaces for visiting researchers and curators (Fig. 17). Most collections work is done on the layout tables at the curved cocoon ends, linked but separate from the main storage areas. Some specimen preparation work, such as mounting microscope slides and field sample sorting is done in small laboratories and there are meeting rooms, two of each on each floor. Access to the working areas and collections stores of the new buildings is restricted to staff only with booking in and monitoring of bona fide visitors, to secure the collections and to keep the environmental controls steady. One problem we have found within the cocoon, and many of the office areas, is that there is no mobile telephone signal due to the cocoon's 'Faraday cage' nature. There is a spacious common room with an open air veranda on the eighth floor for both front and back of house staff in the Darwin Centre.

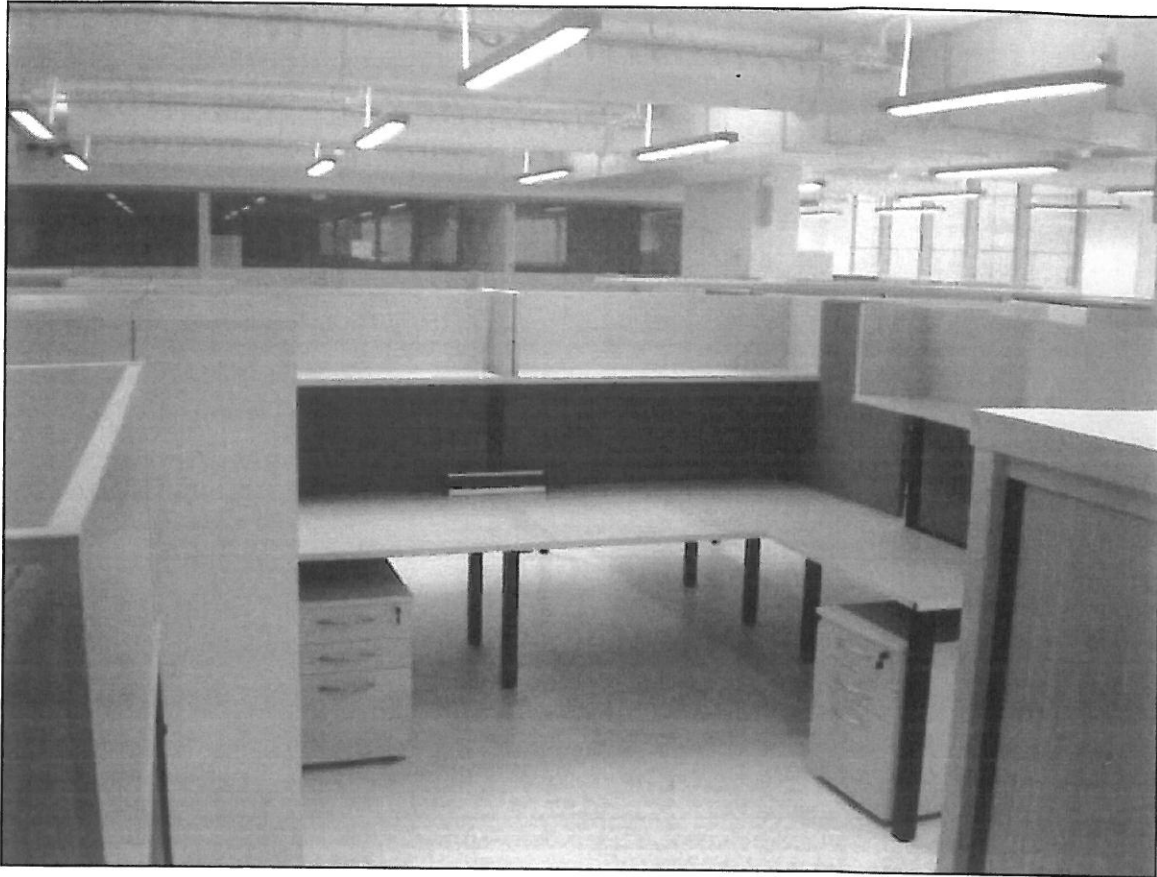


Fig. 17. Our new office bays in DC2 North, photo courtesy of Ed Baker.

As part of the public offer and to fulfil the requirements for some of the funders, the building has been designed for public entry and interaction, with a public gallery through the Cocoon. The free self-guided tour starts as you enter the lifts which take you up inside the atrium with panoramic views of the cocoon and the west gardens. The journey then enters the top of the Cocoon where there are displays and video loops (with subtitles); introducing the tour are virtual Museum Curators and Scientists; a view into the historic Botany collections; cracking the DNA code with views into the DNA Laboratories; and field work, which includes videos of Museum expeditions to Panama, The New Forest, Taiwan, Thailand and the Museum's Wildlife Garden. To illustrate the preparation of specimens for our collections and for research, we have our Specimen Preparation Area where we prepare plant specimens and sort insect samples from lacustrine deposits, soil and leaf litter samples and intercept trap catches collected from expeditions. We have fume extraction for spirit work, plant presses, a microscope camera and screen and connection for laptop use so that many different jobs can be done. Here, the public have the chance to speak to Botany preparators and Entomologist Scientists and curators behind a glass panel through an intercom system (Fig. 18). Then there is a view into the Sackler imaging laboratory and final views into the 5th floor Botany cocoon store. With our colleagues in 'Public Engagement', we are improving the design and user friendliness of the Cocoon exhibits. We have a team of visit planners and learning staff who frequent the atrium and Cocoon, who are there to answer questions from and to care for the public. I have lead tours of the cocoon and lab areas for these staff members so that they know what we have behind the scenes and to furnish them with additional facts.

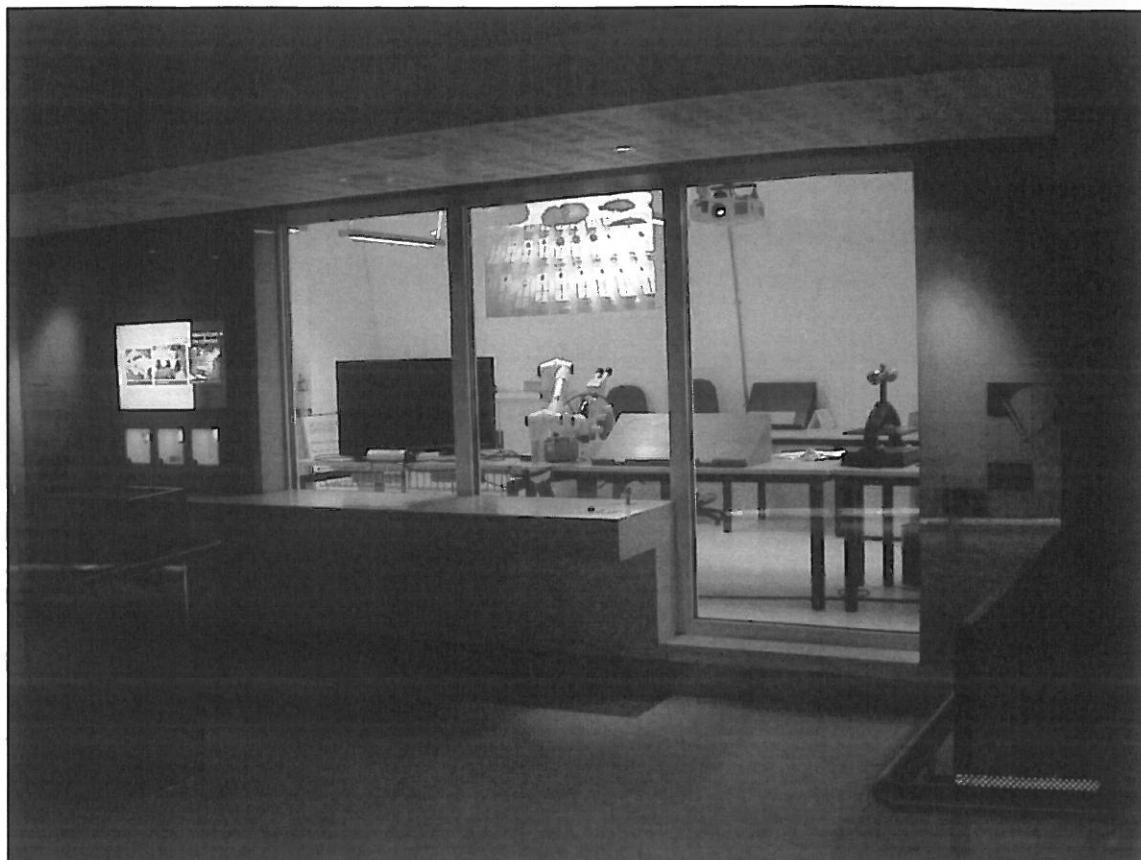


Fig. 18. The DC2 Specimen Preparation Area (SPA) where the public can speak to the Scientists and preparators.



Fig. 19. Prince William with the NHM Director, Michael Dixon at the DC2 opening ceremony, 14th September

The visitor leaves the Darwin Centre knowing what, why and how we collect, care for and research our collections. Even though called the Darwin Centre, there is strangely no mention of Charles Darwin or the 'Theory of Evolution' in the exhibition content. Off the Ground floor atrium, we also have the state of the art, Attenborough Studio which is the home of the Museum's Nature Live events where staff present their research and curatorial work to the public. Off the Lower Ground floor of the atrium, there is the Angela Marmont Centre for UK Biodiversity. Here we have identification and advisory services, synoptic British collections and the London Natural History Society Library and a suit of facilities for external natural history training courses. There is access out of the second phase across the courtyard, into the wildlife gardens so that course participants can view and catch specimens and bring them into the Angela Marmont Centre for closer study. The second phase allows visitor access again to the first phase ground floor displays of the Zoology spirit collections.

The grand Darwin Centre opening occurred on 14th September 2009 with His Royal Highness Prince William and Sir David Attenborough attending (Fig. 19). If you have not visited us already, why not come and be amazed by our new iconic buildings and book to join the free public tours! If you wish to visit any of the collections area within the cocoon one needs to book an appointment with the relevant Botany and Entomology Collections Managers.

Acknowledgements

The Darwin Centre would not have been possible without the sponsorship and financial support of the following organisations and individuals:-

1. Department of Culture, Media & Sport
2. The Heritage lottery Fund
3. Accenture
4. The Alborada Trust
5. Anglo American PLC
6. William Brake Charitable Trust
7. The Cadogan Family
8. The Charles Dunstone Charitable Trust
9. The John Ellerman Foundation
10. Claire Enders
11. Glaxosmithkline PLC
12. The Horace W. Goldsmith Foundation
13. Joy Harrison
14. The Rufford Maurice Laing Foundation
15. John Lyon's Charity
16. Professor Anthony & Mrs Angela Marmont for the AMC UK Biodiversity Centre
17. The Mercer's Company
18. Patrons of The Natural History Museum
19. The PF Charitable Trust
20. The Rayne foundation
21. Mr Gerard Ronson & Dame Gail Ronson DBE
22. Royal Commission For The Exhibition of 1851
23. The Dr Mortimer & Theresa Sakler Foundation for the Imaging facility
24. The John Jefferson Smurfit Monegasque Foundation
25. The Garfield Weston Foundation
26. The Wolfson Foundation for the new laboratories.
27. Our many anonymous donors

We also wish to thank HOK International Architects & Danish architects C.F. Møller for the Design of phase one & phase two respectively; Heery International Ltd for the demolition works; Turner & Townsend cost consultants; Manly Development Services Ltd Project Management; HBG Construction for the building work; C & D Sheet Metal Ltd for the design and manufacture of our new Cocoon Entomology and Botany cabinets; Rackline Ltd for the installation of the Cocoon roller racking; Godfrey Syrett for supply of the new office and laboratory furniture; Nexus Ltd for the removal of Entomology and Botany collections and staff; Maersk Ltd for the use of three freezer containers to freeze our Botany collections in transit from old to new accommodation; Jez Bum and the Special Effects team for improving the Cocoon interactives; the Darwin Centre planning team led by Dr Nigel Fergusson, Dr Mike Fitton and Nadia Lupo, Oliver Crimmen and Roberto Portela Miguez of the Zoology Department for information on the Spirit Building and improvements to the manuscript; Malcolm Scoble, Keeper of Entomology and Claire Gilby, the Museum's Senior Press Officer for comments on the manuscript, Ed Baker for photos and finally the Trustees, Directorate & Staff of The Natural History Museum. Photographs by P. A. Brown unless otherwise stated.

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