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Insects (and some other terrestrial arthropods): a perennial theme

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The ubiquity of insects, their broad ecological and biological interest and their economic importance, have ensured the persistence of entomological teaching and research throughout the history of the Department of Zoology at the University of Glasgow. Also, from the museum point of view, insects have had a high profile dating from the foundation of the Hunterian Museum and the insect cabinets of William Hunter, who had engaged J.C. Fabricius as his curator from 1772 onwards. This is one of the three substantial surviving collections containing primary type specimens of Fabrician names. The others are his own in Kiel, Germany and in that of Joseph Banks in London. J.G. Kerr's role in curating the Hunterian zoological material is described in *Gallery of Memories* (this volume).

Several entomological themes and research by staff are described here briefly, the majority being from 1953 onwards. Some references as examples of their work are given at the end. Within the Department of Zoology undoubtedly the most famous entomologist was Roy Crowson who spent his life and career studying the Coleoptera. One of the principal sources of specimens for his morphological and anatomical research was the extensive beetle collection of T.G. Bishop (1846-1922) that came to the Hunterian in 1923. As Roy Crowson's wife Betty expressed in her introduction to Roy's 80th birthday two volume *Festschrift*: "Major regrets are that [now] no Glasgow grocers are interested in beetles …" (Crowson, 1995). The explanation of this phrase is that Bishop, profiting from his Coopers grocery business (later Coopers Finefare supermarket chain), was able to develop his hobby by purchasing entire collections through dealers and auctions on a world scale. Roy's output, in addition to 200 papers, included three books (Crowson, 1955, 1970, 1981). Information on his activities in Glasgow is provided by Hancock & Robinson (2021).

During the last century it has been mainly the economic impact of insects on humans that has driven insect research and teaching. Their medical importance, particularly as vectors of diseases, was of interest to Edward Hindle, J.G. Kerr's successor as Regius Professor, who encouraged entomological work. In 1935 Hindle was able to obtain an important synoptic collection of mosquitoes from the private collection of F.V. Theobald (1868-1930) to support such research. Alex Haddow (1912-1978) discovered the Zika virus and vectors of yellow fever in Africa, later completing his time as Professor of Administrative Medicine at the University and then Dean of the Faculty of Medicine. During World War 2, J.D. Robertson (1912-1993) served in the Army Medical Corps researching mosquito vectors of malaria and the effect on soldier training and efficiency when operating in tropical situations. After returning to work in Glasgow, Robertson deposited large numbers of preserved mosquitoes, mainly from West Africa, but then turned his attention to non-entomological interests. Today, mosquitoes are an important area of research and teaching through Professor Heather Ferguson and colleagues whose work embraces their role as disease vectors both in Africa and Scotland.

Biting midges were studied by Anthony Downes, J.W.H. Lawson and D.S. Kettle who found new species in Scotland (Downes & Kettle, 1952). Downes continued to work on this family after emigrating to Canada.

M.V. Brian (1919-1990), a specialist in ants, was appointed lecturer in 1946 and left in 1953 to manage the Freshwater Research Station at Furzebrook, Dorset (Elmes & Stradling, 1991). While in Glasgow he met a fellow entomologist also working on ant biology, Anne ("Anthea") D. Synge (1919-2007). They married in 1947 and published together (Brian & Brian, 1949). The next year they wrote on birds predating caterpillars using their home address in Cardross (Brian & Brian, 1950). This might imply that Anthea was obliged to resign from paid work as a married woman. Anthea's PhD (London) was followed by research on social Hymenoptera at Rothamsted Research Station. While in Glasgow the Brians started a family but after moving to Dorset they separated and she moved to Hereford. She became interested in and heavily involved with local history, archaeology and wildlife trust work maintaining her married name. A number of research students worked with M.V. Brian. These included J.S. Weir (1951-1954) who moved to University College, Salisbury, Rhodesia (now Harare, Zimbabwe) in about 1958 (Weir, 1959), and D.W. Hall (Hall & Smith, 1954). The best-known work on ants by Brian is the volume in the Collins *New Naturalist* series (Brian, 1977).

Pamela Allen (1929-2019) graduated in Zoology, Queen's University of Belfast in 1951 and was awarded a Northern Ireland Scientific Research Maintenance Grant for three years. This was spent mainly at the Silwood Field Station run by Imperial College (London) where she started research on Agromyzidae (Diptera). Some of this family of phytophagous leaf-mining and stem-boring flies are important crop pests (Fig. 1). She lectured in Glasgow from 1955 working with Alex Hill during which time she continued her research and published the results (Allen, 1957) but left in 1958 for Ghana where she and her husband, John ("Ian") Forsyth (1929-2023), also an agricultural entomologist, worked

Fig. 1. Pamela Allen at her bench at Silwood Park, Imperial College Research Station, Berkshire (July 1952). (Photo: Tony Irwin)

for several years. A collection of Agromyzidae Allen donated to the museum in 1954 also contains some parasitoid wasps she reared from agromyzid immature hosts.

Elspeth (christened Elizabeth) M. Cawthra completed her PhD on weevils (Coleoptera, Curculionidae), supervised by Roy Crowson, in 1957. One of her papers (Cawthra, 1957) was illustrated with figures by Peter Belton (1930-2019) who was studying for his PhD at the same time. Both he and P.N.R. Usherwood researched insect neuromuscular systems under Graham Hoyle. Peter Belton and Elspeth married and moved to the U.S.A. and then Canada. Considerable detail of their life and career together is given by Hart (2019) even to the point of mentioning that Peter Usherwood lent his kilt to Peter Belton so that he could go to Scottish Country Dancing classes in his wooing of Elspeth.

Suzanne L. Ullmann (1935-2014) came to Glasgow in 1967 having researched on the developmental biology of insects for her PhD (London) and during three years in Edinburgh's Institute of Animal Genetics. Suzanne used the common mealworm, *Tenebrio molitor*, as her target species (Ullmann, 1973). A large number of serial sections of mealworm larvae etc., and copies of her papers are deposited in the Hunterian. After a few years, following a visit to Australia, she changed to study marsupial reproductive systems, establishing captive breeding populations of potoroos (*Potorous tridactylus*) and opossums (*Monodelphis domestica*) in Glasgow. This work continued after her retirement during which time she also obtained a Bee Masters Certificate from the Scottish Beekeepers' Association. That led to her being in much demand for lectures on apiary, judging honey competitions and attending international conferences on the subject. Ken Lockey joined the department in 1959 and pursued his research into the diversity of the lipids that waterproof insect cuticles (Lockey, 1985). Ken's research was limited by his heavy teaching responsibilities, especially to medical students. Another investigation into how insects are so successful was pursued by parasitologist Ann Lackie (in post 1976-1988) who worked on how their immune systems cope with parasites: she surprised us all by resigning to pursue a new career in creative writing and broadcasting, which she has done successfully since as Ann Lingard.

Ron Dobson's work in Glasgow, starting in 1959, spanned a considerable range of entomological subjects including agricultural and stored product pests (Dobson, 1964, 1972). Insects such as leatherjackets (larvae of cranefly - pests of cereal roots and horticultural crops) and flea beetles (leaf-eating pests of cruciferous plants) were also of interest. Ken M. Stewart was supervised by Ron for his PhD on cranefly larvae in 1969 and went on to work in South Island, New Zealand for 16 years on grassland pests, before returning to posts at Ayr Technical College and then de Montfort University (Leicester). The commercially available larval extraction Salt-Hollick apparatus used by Ron (Fig. 2) was rejected by Ken in favour of his own design, published later (Stewart, 1974). Ron also researched scabies mites, of dermatological importance, and house-dust mites, ubiquitous domestic pest species that cause respiratory diseases in humans. One of Ron's last PhD students, Matt Colloff, worked on these animals for his PhD in medical entomology (1982-1985), followed by postdoctoral research on the immunology and epidemiology of allergic diseases. Matt moved to Australia in 1994. Connected with Ron's previous employment as an Inspector with the Ministry of Agriculture prior to starting in the University, specimens of stored product pests including some from ship-borne bulk materials arriving in the Clyde docks were deposited in the museum. As a result of enquiries directed to various members of staff from the government bodies responsible for biosecurity, as it is now termed, these started to accrue during the immediate postwar period. New work on arachnids as disease transmitters is being pursued in the Scottish Highlands and Islands by a group led by Roman Biek, which is surveying ticks and their role in the spread of Lyme disease (Millins *et al.,* 2021).

Tony F.G. Dixon started his career in Glasgow from 1958. In addition to many papers on aphids his substantial and influential book on them was first published in Glasgow (Dixon, 1985). Two further editions followed with substantial revisions produced after he moved to the University of East Anglia in 1974. Dixon also supervised the research of Walter Edgar on the ecology of wolf spiders, resulting in several papers (Edgar, 1971) and his joining the Zoology Department's staff. Aphids were studied by Alex Hill (1919-2006) in connection with diseases in raspberries. He also worked

Fig. 2. Ron Dobson with the Salt-Hollick apparatus for extracting insect larvae from soils. (Photo: Hunterian Museum archives)

on the heteropteran predatorial bugs - *Anthocoris* spp., and his collections were deposited in the museum (Hancock & Dobson, 2008).

The long connection with the Scottish Agricultural College (SAC) has had a strong element of entomology. Agnes A. Meikle (died 1951) was a lecturer from about 1930 based at the then West of Scotland Agricultural College in Blythswood Square, Glasgow. She had an interest in the dipteran family Tephritidae, many species of which have larvae that are leaf miners or fruit feeders. Her research files were deposited with C.M. Yonge by Professor L.A.L. King, head of the College. Several papers were published on insect pests and species that attacked bracken that might have a role in its control (King & Meikle, 1933). Alexander Cuthbertson (1901-1941) graduated from the College and later was to supply insects from Rhodesia for teaching agricultural entomology on the courses at Glasgow (Hancock & Moore, 2017). Graduate degrees and doctorates supervised at the SAC were awarded by the University of Glasgow and there have been strong academic connections between staff, Professor Garth Foster, Professor Davy McCracken, Dr. Lorna J. Cole and Dr. Shona Blake whose work focused on insects.

Professor Mike H. Hansell used the building behaviour of insects as a major part of his research into animal architecture. Species studied ranged from caddis flies, moths and beetles that build protective cases, to the social insects - ants, bees, wasps and termites - and their nest building behaviour. The use of silk by moths and butterflies for cocoon construction, the web-spinners (Embioptera), as well as spiders, also featured. Mark R. Cole, one of Mike's research students, studied nest construction and development in vespine wasps for his PhD.

Museum-based entomologists manage access to the collections, lecture, supervise student projects, conduct research and provide identification services. Geoff Hancock was appointed in 1997 to deliver a Heritage Lottery funded project to upgrade storage and access for the insects, public programmes and an exhibition. Geoff later obtained a post as the first Hunterian Museum entomology curator and, after his retirement in 2015, Jeanne Robinson became Curator of Entomology. Research falls into a number of categories, some result directly from supervising Honours projects (Barabás & Hancock, 2000) or from active field work (Robinson & Hancock, 2008) and some particular taxonomic interests are pursued (Hancock, 2006). The historical importance of the collection has engendered a considerable output (Hancock, 2015; Robinson *et al*., 2018; Robinson & Vane-Wright, 2018).

In 2021, entomology was strengthened by the appointment of Oskar Brattstrom. He initially studied the migratory ecology of red admiral butterflies, but since 2005 has worked on the speciation patterns of the Satyrinae butterflies found in Africa, South-east Asia and Australia, investigating the roles of ancestral genetic constraints and local ecological factors (Brattstrom *et al*., 2020). His focus now moves to the conservation of Nigerian butterflies and, in Scotland, to stream invertebrates as bioindicators.

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