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Editorial

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Roger Blackman 1941–2022—an appreciation

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Introduction

FIGURE 1. Roger Blackman at work with the NHM aphid collection in June 2019 (Photo graph by M. Kanturski).

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Dr Roger Laurence Blackman (Fig. 1) passed away on 17 March 2022, after more than 50 years dedicated to advances in aphid science. There can be very few scientists studying any aspect of aphids whose papers have not cited the works of Roger Blackman. To his name, we add that of Victor Eastop (1924–2012), for the two of them formed an inspirational, complementary and indefatigable pair at London's Natural History Museum. Together they were responsible for, amongst many other seminal works, the three testaments of the aphidologists' bible: *Aphids on the World's Crops*, *Aphids on the World's Trees* and *Aphids on the World's Herbaceous Plants and Shrubs*, now brought together and regularly updated by Roger until very recently in the online version, *Aphids on the World's Plants* (www.aphidsonworldsplants.info). Victor was an out-and-out taxonomist, absolutely amongst the best the world has known, whilst being very familiar with most aspects of aphidology. Roger's contributions were broader, as we shall see.

Life and times

The back cover of Roger's extraordinarily brilliant introductory book on aphids, just called *Aphids* (Blackman 1974), tells us a little about his early life; but first we want to tell you about the book (now out of print). Following a succinct introduction to aphid morphology, life-cycles, morph determination, genetics, development, behaviour, feeding and nutrition, natural enemies, ant mutualism and population dynamics, there is a host-plant list, notes on common British species and a key to common British genera. It finishes with techniques for studying aphids, including the world-renowned (amongst aphidologists!) "Blackman Box". Roger arranged for one of us (RH) to visit the great Dick Hille Ris Lambers (DHRL) at his home in Ede-Wageningen. That's another story, but DHRL told RH that he would never have been able to write that book himself as he wouldn't have been able to generalise, and ignore the exceptions that would have detracted from the aims of the work. Dick described the book as a triumphant masterpiece. Roger was just 33 when it was published.

So, to the back cover. Roger was born in Heston, in the London borough of Hounslow, UK. He went to Isleworth Grammar School and then to Bristol University, where he graduated in Zoology in 1962. He studied for a Ph.D. at Imperial College's field station at Silwood Park, working on the feeding habits of ladybirds. His supervisor was the aphidologist Michael Way, sometimes referred to as "the father of IPM". Mike worked particularly on the ecology and control of *Aphis fabae*, so it is perhaps no surprise that Roger became as interested in the prey as the predator. His first job was as an entomologist with the Commonwealth Institute of Biological Control (now CABI) and he spent most of his three years in Patagonia (Argentina) funded by the New Zealand government, searching for parasitoids and predators of that country's pasture insect pests. In 1968, he returned to Silwood to begin work on aphids, initially on their morphological variation, cytology and genetics. In 1973 he moved to the Natural History Museum, where in 1986 he gained Individual Merit Promotion to what used to be called "Senior Principal Scientific Officer"; he remained there for the whole of his working career and beyond. Officially, he retired in 2001 (in those days you had to leave at 60) but he continued to visit the Museum regularly as a Scientific Associate.

Research highlights

Overview

Roger was interested in the biology of aphids, particularly in their variability and its environmental and genetic control, the evolution of their relationships with their host plants and, of course, taxonomy. He made several notable discoveries which aphidologists now take for granted, the most important of which are outlined below.

Apomictic parthenogenesis

For aphidologists, it seems hard to imagine a time when it was not known that aphids reproduce by apomictic parthenogenesis. In other words, no meiosis is involved; mature egg cells are produced by mitotic divisions, and these cells develop directly into embryos. Offspring are thus clones of their mother, and genetically identical except

for any mutations occurring during or after oogenesis. Roger showed this through both experimental and cytological techniques (Blackman 1978). He comprehensively rebutted a theory that, during development of a parthenogenetic egg, crossing over occurs between homologous chromosomes with consequent recombination of genetic material ("endomeiosis"; Cognetti, 1961). He also made big advances in the understanding of mechanisms of spermatogenesis in aphids, showing that it does not involve chiasmata during meiosis (Blackman 1976, 1985; Spence & Blackman 1998), also advancing understanding of oogenesis (Blackman 1976) and sex determination (Blackman & Hales 1986) in aphids; and he prepared the first comprehensive review of sex determination in insects (Blackman 1995).

A chromosome translocation linked to insecticide resistance

The aphid species with which Roger is most famously associated is *Myzus persicae* (the Peach–potato aphid or Green peach aphid). This aphid is a major agricultural pest, the more so because of its propensity for developing resistance to insecticides. The first insecticide group to fall victim was the organophosphates; Roger found this resistance to be associated with a chromosomal translocation in the gene otherwise conferring resistance (Blackman *et al*. 1978). Roger was the first person to apply *in situ* DNA hybridisation techniques to aphid chromosomes and, with the help of Jennifer Spence, he used these to study the location and inheritance of insecticide resistance genes in *M. persicae* (Blackman *et al*. 1996), the orientation of X chromosomes during spermatogenesis (Spence & Blackman 1998) and the inheritance of chromosome fusions and dissociations (Spence & Blackman 2000).

Androcycly

Another important phenomenon in aphids, discovered by Roger, is androcycly (Blackman 1972). In certain species, some lineages are parthenogenetic and never produce oviparae but can produce a few males. This is important because it means that the trait for overwintering in the mobile form as opposed to an egg (*i.e.*, continuous parthenogenesis) can be passed through the sexual phase when males from lineages showing androcycly mate with oviparae from holocyclic genotypes. *Myzus persicae* is a prime example of this; thus, it can take advantage of warm winters by continuing parthenogenetic reproduction without host alternation, giving it a flying start in spring but, in cold winters which kill the mobile stages, it can survive as a cold-tolerant egg provided that the primary host (peach) is available. This adaptability contributes to the pest status of the species; the important cereal pest, *Rhopalosiphum padi*, is another example.

Taxonomy

Roger's extensive taxonomic work has centred on the use of cytological, biochemical and morphometric data to analyse aphid species complexes (Blackman 1980, 1992; Blackman & De Boise 2002) and, in collaboration with Vic Eastop, providing identification and information manuals for the rest of the worldwide aphidological community (*e.g.*, Blackman 2010; Blackman & Eastop 1994, 2000, 2006; Blackman *et al*. 1998, 2019). In no other economically important insect groups are researchers blessed with such resources.

In addition to his keys to aphids, at the first-ever International Symposium on Aphids (in Jablonna, Poland in 1981) Roger produced a marvellous key to the aphidologists there gathered. Here are some sample couplets:

4 Colour of dorsal cephalic hairs mainly white or grey 5
Colour of dorsal cephalic hair not grey or white. Darker 6
5 Hairs on lower mandible forming a wedge-shaped mass, much longer than broad, and longer than rostrum . . . . . Hille Ris Lambers
Hairs on lower mandible forming a short, conical mass, shorter than broad, and shorter than rostrum . . . . . Eastop.

Another couplet uses "Opinions evident" vs "Opinions much less evident". Some workers are described as "specimen only seen pickled in alcohol"!

Awards and honorary positions

Roger was presented with the Bicentenary Medal of the Linnaean Society of London in 1979. This is awarded to just one person each year in recognition of exceptional achievements of a biologist under the age of 40. He was President of the Royal Entomological Society for two years (1998 to 2000) and contributed much to the Society in numerous ways.

Authors' anecdotes

RH Time is a strange thing. Roger was 80 when he passed away, which means that he was only 35 when he began supervising my Ph.D. I look at 35-year-old scientists now and wonder whether they could possibly be held in esteem by their students to the degree that I held Roger. This was esteem not just generated by my awareness of the great work Roger had done and was doing, but by his gentle and inspirational supervisory skills. I have a confession. I have two papers from my Ph.D. – my first ever scientific papers, of which I was extremely proud. Roger, of course, was hugely influential in the conception and supervision of the work leading to their publication, not to mention the editing prior to submission; but I was a rookie student with no appreciation of publication etiquette. To my shame, it didn't occur to me to invite Roger to be a co-author and, in spite of having had a major hand in their preparation, he didn't say a word and they are single-author papers. Perhaps he didn't want to be associated with them, but I'm as certain as I can be that that was not the case, but rather it was an example of Roger's enduring modesty. It took me until 2013 to make amends, my only paper published with Roger being Kati *et al*. (2013) on the identity of the UK's *Schizaphis* species. It was Roger who put me in touch with Roy Taylor, leading to my career at what is now known as Rothamsted Research. Bearing in mind his excellence as a supervisor, it is perhaps surprising that Roger only had six Ph.D. students. I hope that I did not put him off.

FIGURE 2. Roger Blackman, an unidentified attendee and Andrew Polaszek in Smolenice, Slovakia, September 1985 (Photo O. Heikinheimo).

GW My Ph.D. studies on the British species of *Macrosiphum*, contemporary with those of RH, were under Vic Eastop's supervision. However, in 1978 Vic went to work in Iran for several months so Roger kindly took over my supervision during that time. Despite being busy he was always very approachable and willing to answer questions

or discuss issues, generously sharing his microscopes and library, and putting up with another student underfoot. Two of my early papers (Blackman *et al.* 1989 and Blackman *et al.* 1995) were published with Roger, a useful learning experience. Studying aphids provided me with a good science base from which to develop my career working on scale insects (Hemiptera: Coccomorpha).

AP I completely endorse Richard's comments above regarding Roger's approach and skills as a supervisor. I'm equally guilty of neglecting to include him as a co-author on my first major paper, but perhaps the ethics were different at that time in the NHM, compared with a university. Certainly, nowadays it would be unthinkable. I'd like to relate one particular anecdote that I think speaks volumes about Roger's support of, and attitude towards, his students. Late one evening in the Summer of 1985, I noticed on Roger's desk a notice of an upcoming aphidologists' (and thysanopterists') meeting to be held in September in Czechoslovakia (as it then was). An extremely modest budget had already been agreed to bring Roger, Vic Eastop, Laurence Mound (then Keeper of Entomology) and Jenny Palmer to the meeting. Each of them decided to give up 20% of their allocations to enable me to attend. One consequence was that poor Roger had to share his hotel room in Vienna with a scruffy 25-year-old student (Fig. 2). I am so grateful to this day for an opportunity that was not only career-changing (presenting at my first major international symposium), but life-changing: during the symposium I met my current wife of 32 years and counting.

MK I met Roger in 2013 during my first visit to the Natural History Museum, when I was working on my Ph.D. on European *Eulachnus*. As a young and very inexperienced aphidologist, it was one of my dreams to meet one of the most important people who had shaped the taxonomy and systematics of aphids over the past 50 years. Roger often came to the Museum during my visits and we had numerous discussions, especially on Lachninae (one of my favourite groups). During our last lunch before the Covid pandemic, I told Roger that I planned to organise the next International Symposium on Aphids in Poland again, 40 years after the first (I know he wanted to go there again very much), and I told him that I would like to "revise" the key to aphidologists. Roger told me then (with his special sense of humour) that not all were happy at the time he published his key, and some of them were offended, *e.g.*, by the "body shape" features, but that I should use similar characters. Roger was my very good colleague in discussions, always asking me, "Why? I don't think so, convince me" which always encouraged me to think much further and wider. I will miss his "friendly reviews" of my first manuscripts, which returned to me almost red at the beginning. RH said that Roger had only six Ph.D. students, but I am convinced that there were many more informal ones (Fig. 3).

FIGURE 3. Roger Blackman, Richard Harrington and Mariusz Kanturski at the 2nd Joint UK-French Meeting on Aphids in Harpenden, UK in 2019.

CF Although Roger and I crossed paths at the International Symposium on Aphids in Rennes in 2001, unlike my co-authors, it is my chagrin to have never known Roger in person. We corresponded frequently, exchanging ideas and references, resolving discrepancies between AphidsOnWorldsPlants.info (AWP) and Aphid.SpeciesFile.org, and evaluating the literature that gave rise to them. He frequently amazed me with his encyclopedic knowledge across the breadth of the aphid infraorder, bringing to my attention biological details of taxa I had thought beyond his expertise from geographic regions far from his personal experience. Databases were a concern, lacking the intimacy to data curation he put into his work. It was his attention to detail that makes AWP such a powerful tool, but it also gave him misgivings when users made of it an inappropriate shortcut to their own meticulous research. Roger asked that I assume responsibility for AWP. There only ever was one person with the knowledge, resources, and capacity to maintain it properly but, perhaps, collectively, we the aphidologist community can find the ways and means to honour Roger's legacy.

DO Not long after my arrival as a researcher at the Natural History Museum in London in 2012, Laurence Mound asked me if I would agree to take over Jon Martin's role as a subject editor for the journal *Zootaxa*, Jon having retired just before I arrived. The taxa I agreed to cover were the jumping plant-lice (which I knew quite well), whiteflies (which I had just started to study) and aphids (about which I knew very little). Since then, more than half of the 167 manuscripts I have edited were on aphids; this would not have been achieved with the same level of quality without Roger's essential help as a regular reviewer. I do not want to displease the other colleagues who kindly act as reviewers regularly for me, but the excellence of Roger's reviews, the relevance of all his remarks and suggestions and the accuracy of his evaluations were exceptional. I confess that I may have 'over-used' Roger as a reviewer over that time, and consequently there may have been a Roger Blackman effect or bias in the editorial decisions taken. I have no doubt that this bias was of positive benefit to aphid systematics, and already I miss our fruitful collaboration deeply.

Conclusions

As well as accomplishing a phenomenal amount of pioneering research himself, Roger's work has been invaluable to the achievements of almost all those studying aphids. He has never sought the limelight, his only ambitions being to do good science and make it easily accessible to others. Some aphids are pests, although many are completely benign. Most play an important part in ecosystem function and some are of conservation concern. They are good models for fundamental science. No matter what people's motivations are for an interest in aphids, Roger will have made it easier for them to achieve their goals.

Acknowledgements

Much of the information given here was cribbed from Roger's *curriculum vitae*. The authors thus thank him not only for his immense contribution to aphidology and to their careers, but also for unwitting help in preparing this account. We apologise for any errors, omissions, understatements and exaggerations. We are indebted to Mr Paul Brown (Natural History Museum, London) for his help in listing Roger Blackman's publications.

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APPENDIX

List of taxon names given in honour of Roger Blackman (names published in this special volume are marked with an asterisk):

Genus-group names

Blackmania Kanturski & Wieczorek, 2015

Species-group names

**Acaudinum* (*Acaudinum*) *rogeri* Kadyrbekov
Aphis blackmani Kadyrbekov, 2019
**Aphis rogerblackmani* Nieto Nafría, Ortego & Mier Durante
**Aphis rogeri* Qiao
Capraphis blackmani Mier Durante, Ortego & Nieto Nafría, 2009
Elatobium blackmani Binazzi & Barbagallo, 1996
**Eulachnus blackmani* Kanturski, Qiao &Favret
Eutrichosiphum blackmanum Agarwala & A.K. Ghosh in A.K. Ghosh & Agarwala, 1993
Geopemphigus blackmani Muñoz Viveros & Remaudière, 2000
**Hamamelistes blackmani* Dederich & von Dohlen
**Maculolachnus blackmani* Kanturski & Chakrabarti
**Medocellodes blackmani* Drohojowska & Szwedo
**Metopolophium rogeri* Mehrparvar, Rokni & Rakhshani
Neuquenaphis blackmani Nieto Nafría & Brown, 2019
**Periphyllus blackmani* Li & Huang
**Pleotrichophorus blackmani* Barjadze, Halbert & Kanturski
Sitobion blackmani Forbes & Chan, 1993
**Stomaphis blackmani* Lee, Kanturski & Lee

List of taxa established by Roger Blackman:

Subgenus

Adelges (*Annandina*) Favret, Blackman & Stekolshchikov, 2015

Species

Amphorophora tuberculata Brown & Blackman, 1985
Aphidura corsicensis Nieto Nafría, Blackman & Martin, 2014
Aphidura libanensis Nieto Nafría, Blackman & Martin, 2014
Aphis bozhkoae Eastop & Blackman, 2005
Aphis cornuta Blackman & Brightwell, 2019
Aphis polii Barjadze, Blackman & Özdemir, 2015
Euceraphis borealis Blackman, 2002
Euceraphis papyrifericola Blackman, 2002
Euceraphis quednaui Blackman, 2002
Geoica harpazi Brown & Blackman, 1994
Geoica wertheimae Brown & Blackman, 1994
Glyphina pseudoschrankiana Blackman, 1989
Kaochiaoja sikkimensis Joshi & Blackman, 2017
Macrosiphum eastopi Barjadze & Blackman, 2017
Myzus icelandicus Blackman, 1986
Stomaphis knechteli Binazzi & Blackman, 2003

Stomaphis bratislavensis Czylok & Blackman, 1991

Subspecies

Myzus persicae nicotianae Blackman, 1987

List of publications by Roger Blackman:

Website

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