

Dr Donald Alister Griffiths (1927-2018)

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Don Griffiths died on 6th July this year and acarology lost another great researcher and innovator. He had an all-embracing understanding of his subject, and delighted in sharing his knowledge. Don always had great conversation and injected a humorous side whenever he had the opportunity. He is much missed.

Don was born on 2nd July 1927 in Pontypridd, Rhondda Cynon Taf, south Wales. After compulsory National Service spent in the Army in Germany (1945-1948), he began his higher education at the University College of Wales, Aberystwyth (now Aberystwyth University). He obtained his Bachelor of Science in 1951 and subsequently joined the UK Ministry of Agriculture and Fisheries as an Insect Inspector, working at stations in Nottingham and then Hull, England. Part of his work at the latter was to inspect ships' cargos, a very dangerous job as many of the holds were equipped with no or only a few ladders and access was often

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by rope – health and safety concerns for employees were not high on the agenda then. It was while examining samples from flour mills at this time that Don became interested in mites and he pursued this interest by working for a Master of Science (awarded in 1958) at the University of Minnesota, St Paul, USA. His research, funded by a Kellogg Foundation Fellowship and supervised by the mycologist Clyde Christensen, concerned the relationship between astigmatid mites and fungi found in stored grains. After completing his degree in one rather than the normal two years, Don returned to the UK. In 1960, he joined the Biology Department of the Pest Infestation Laboratory, Slough, Berkshire, as a Civil Service Senior Research Fellow and subsequently became a permanent member of staff. The government-funded laboratory, later to become the Pest Infestation Control Laboratory and then Slough Laboratory, was set up to study insect, mite and fungal damage to harvested crops at all stages of their storage, transport and processing. The core work of the Department was to produce ecological, physiological and biological research data that could be used to develop pest control programmes in food and related premises.

During his early years at the laboratory, Don carried out some of the first comprehensive surveys of mites in UK stored foods and storage premises, and investigated field habitats as potential sources of infestation. He also began his PhD there (awarded in 1963), working under the supervision of Margaret Hughes of the University of London's Royal Free Hospital School of Medicine, who was a leading British expert on storage mites. The main objective of Don's thesis was to clarify species boundaries within the genus *Acarus* Linnaeus, and his preliminary results were considered important enough to be published in *Nature* in 1962. Through hybridization and morphological studies, he had established that *Acarus siro* Linnaeus, the Flour Mite and most serious mite pest of harvested cereals and stored cereal products, was a complex of three species. Up until then, it had long been regarded as a single species with morphologically variable adults and hypopi. The work enabled the reassessment of previous records of material identified as *A. siro*, and, as a result, reliable distribution and ecological data could be provided for the three species.

The variety of Don's work at Slough, with his close-knit team, can be seen in his contributions to the various published reports of the laboratory (*Pest Infestation Research*, *Pest Infestation Control*, *Pest Infestation Control Laboratory Report*). Much of it concerned the taxonomy, biology and ecology of storage Astigmata, but he also authored papers on the plant-parasitic Eriophyidae (Prostigmata) and on mesostigmatid pests of bees. In addition to his *Acarus* papers, Don's major publications included a similar investigation of species boundaries in *Tyrophagus* Oudemans, another astigmatid genus comprising serious pests of stored foods. With Tom Atyeo, Roy Norton and Corinne Lynch, he produced a seminal work on the idiosomal chaetotaxy of astigmatid mites. It was the first attempt to comprehensively apply the chaetotaxic system devised by F. Grandjean for the Acariformes to Astigmata. The setal homologies identified and notations applied in the study have been widely followed since. In the late 1970s to 1980s, the threat posed to world bee-keeping by the parasite then identified as *Varroa jacobsoni* Oudemans (Mesostigmata: Varroidae) was the focus of much research attention. Don took on a high profile in the international effort to track the mite and understand its behaviour. He published several review papers; for example, in the early years when little was really known about *Varroa*, information was drawn together in the worldwide survey he carried out with Slough Laboratory colleague Clive Bowman. This provided fundamentally important distribution data for the mite based on authentic identifications from many countries and localities.

Don was responsible for developing a number of highly significant methodologies. One of them meant that mites could be cultured on an industrial level. He wanted living Astigmata for his research and so established a library of populations at Slough. The foundation for this was built on specimens sent in by government inspectors examining food and livestock facilities during the post-war drive to improve UK food production. Don introduced a way of sterilising the mite food so that culturing could be done at scale. In connection with the work of the Committee on Microscopic Dosages of the EEC (European Economic Community), Don and

colleagues, particularly Bharat Thind, developed a flotation technique for determining mite numbers infesting powdered and compacted foods, and house dust. Their method had the advantage over others available at the time of being much more reliable, less time-consuming and not using dangerous organic solvents. It became routinely used for quantitative assessments of foodstuff contamination, for example, in EEC grain buffer stores. Don was also always keen to employ new techniques in his research. He began using the scanning electron microscope soon after it became available – championing it strongly – and obtained important data for papers on taxonomy and functional morphology.

Don's contributions to the wider acarological community while at Slough included bringing the sixth International Congress of Acarology to Edinburgh, Scotland, in 1982. Supported by Clive Bowman and his wife Diane, Don organised a very successful congress, producing two edited volumes of Proceedings published in 1984. Along with his good friends Gwilym Evans and Don Macfarlane, Don was a founding lecturer on the biennial Acarology course organized by the soil zoologist Paul Murphy and held in England at the University of Nottingham's Sutton Bonington Agriculture campus (1962-1987), and finally at the Department of Pure and Applied Zoology, University of Reading (1989). His enthusiasm for mites was infectious, and his ability to communicate the subject with clarity and considerable humour left an impression on participants for many years afterwards. Don delighted in seeing students begin the course with little knowledge of mites and ticks and then blossom into embryonic acarologists by its end. He said that to teach such people always lifted his 'Welsh spirits'. The evening get-togethers in the common room or local pub were highly enjoyable, with Don very much at the centre of things. He always had a funny anecdote – flying on one official trip to what is probably now Kazakhstan, he recounted that he smelt burning in the plane. Turning round, he spotted local farmers lighting and pumping up a paraffin stove in the aisle to heat their food and water!

Towards the end of his Slough Laboratory career, Don was appointed Head of the Biology Department and then Head of Science, with responsibility for some 100 scientists. Inevitably, this role took him away from his first love, morpho-taxonomy. During his tenure, he had to try to reconcile the views of the scientists with those of a government that he saw as increasingly commodifying science. Eventually, in 1987, he decided to leave in order to set up his own consultancy (Acarology Consultants) and divert his energy and enthusiasm to the use of Phytoseiidae as biocontrol agents. He worked as a consultant Director for Bunting Biological Control Ltd (Colchester, England) from 1987 to about 2000, during which time the company changed ownership several times (to Ciba Bunting Ltd, Novartis BCM Ltd and Syngenta Bioline). Don was foremost an acarology consultant, visiting growers in the UK and Europe. He also pioneered the development of a mass rearing programme for *Neoseiulus cucumeris* (Oudemans), a phytoseiid used commercially for thrips control, and established a release system for it based on a breeding population. This methodology was subsequently applied to other phytoseiid species used in biocontrol. Along with his mite work, Don developed an interest in mass-producing bumblebees for pollinating greenhouse plants and began bee production for Bunting Biological Control and the Dutch company Royal Brinkman (later to become Bunting Brinkman Bees). One of the authors (Frits Veenman of Royal Brinkman) worked closely with Don helping him to commercialise bumblebees.

After his association with Syngenta ended, Don became a consultant in acarology for Biobest in Belgium, and then for AgroBío in Spain and its partner Royal Brinkman in Holland, a relationship that lasted until his death. Two of the authors got to know Don particularly well during this time and they share the following personal accounts of him as both their colleague and long-standing friend.

Frits Veenman

‘Writing my thoughts and memories about Don in a nutshell is not easy, because thinking about him is like reading a book with lots of nice stories about the time we spent together.

The first time we met each other was in August 1987 at Royal Brinkman. Stephen Bunting of Bunting Biological Control introduced Don as his new advisor for rearing predatory mites for the horticultural sector. Don impressed me on the very first day, especially with what he had done with mites to produce anti-allergic medicines in the Slough Laboratory. My oldest son was very allergic to dust mites and was successfully treated with medicine from this laboratory.

Don was a friendly person with a clear and practical way of communication. We had a good connection and stimulated each other in Research & Development work for the production of different prey for predatory mites (since 1987) and food for bumble bees (since 1989). For these projects we worked together many times in Holland, England and Spain, and once in China. We visited growers in all these countries. With his humour and spirit Don was also a peacemaker in conflict situations. On the other hand, he was also a fighter in a positive way to encourage people to follow his opinion and to do what he wanted.

Don gave nice presentations to the bio-employees of Royal Brinkman, but also to groups of growers in many countries. Once I visited Kew Gardens in London with him where we welcomed a group of 30 Dutch sweet pepper growers. Don gave a fantastic presentation with slides of photomicrographs. We learned a lot and had great fun.

Talking with Don was for me also learning more about the English language. Especially, the everyday sayings in Dutch and English were nice to compare. If it was needed to park a problem or an R&D item, then he always used to say ‘put it on the back-burner Frits’. Once I surprised Don with an English saying. After I had told him very clearly that he was wrong about something, I finished with ‘that you can put in your pipe and smoke it sir’!

In every relationship there are ups and downs, but my experience with Don was excellent. In 2006, I asked him (at the age of 79 years!) to help Agrobío and Royal Brinkman with predatory mites and prey mites. After I promised his wife Zofia that I would take care of him, he got the green light to accept the challenging job in Spain. Thanks for that, because what he did was very valuable for both companies.’

Enric Vila

‘We were proud to have Don as an advisor from 2007. He was a very active person and although he had been retired for many years he agreed to work as an advisor for Agrobío, thanks to the initial contact through his friend Frits Veenman. Don was one of the very exceptional people with knowledge of different fields of applied acarology, including the taxonomy of astigmatids and Phytoseiidae, as well as experience in biological control and mass production of beneficials, not only mites but also bumblebees. His first project for Agrobío was to set up the mass production of *Amblyseius swirskii* Athias-Henriot, a predatory mite already on the market, which Don himself had proposed to other companies as a perfect candidate for biocontrol years before it became a keystone for augmentative releases. Don was deeply enthusiastic about the project and made it a big success. Soon other challenges were set up, such as the mass production of *Transeius montdorensis* (Schicha), a predatory mite which Don brought into Europe from Australia as a very promising natural enemy. At present, it is one of the most successful biocontrol agents on ornamental crops.

Don never wanted to tell his age and he was very hard-working until the last month of his life. He had the support of his wife Zofia, who is also a scientist and patiently understood his strong passion for his subject. The acarology team of Agrobío was caught up in Don’s enthusiasm and charm. He was not only an excellent scientific advisor, but also a very good friend, with an easy connection with the young researchers. He had a very glowing smile but, on the other hand, showed a very low tolerance for bad science, having a firm tenacity to express his unconformity.

Don was involved in several patents concerning innovative compositions of astigmatids and phytoseiids for developing new mass rearings. He set out his proposal to develop new productions of predatory mites thanks to the combination of the predators with fast frozen

astigmatid mites as food. This new system eliminates the active defenses of the prey mites and has brought the opportunity to mass produce new biocontrol candidates that were not possible to rear when combined with living prey.

Don was really a standard-bearer for Agrobío and made a great contribution to the development of the company, standing out in his modesty and his trusting relationships with others, and far from showing any arrogance or distance despite his great experience and knowledge.'

While Don was working with Agrobío and Royal Brinkman, he also found time to fit in consultancies in Australia and New Zealand. In the early 2000s, for example, Biological Services in Loxton, South Australia, was able to contract his services to help refine off-plant rearing systems for predatory mites. This was instrumental in the company being the first to deliver high concentration predatory mite products to the Australian horticultural market. From then until his death, Don stayed good friends with colleagues there. James Altmann, owner/director of the company commented that Don was a remarkable person with knowledge, abilities and enthusiasm for his work that cannot be replaced, and that it was an honour to have known him and to be his friend.

Don's last solo paper was published in 2015. It was fittingly a taxonomic one and concerned his long-standing quest to establish the true identity of the phytoseiid *Neoseiulus californicus* (McGregor), a species that has attracted much interest as a biocontrol agent of *Tetranychus urticae* Koch (Prostigmata: Tetranychidae) and other phytophagous mites. The paper demonstrates Don's willingness to take on controversial subjects head-on. After presenting a detailed review of the original descriptions and redescriptions of *californicus* and its potential conspecifics, Don concluded that mites sold worldwide by commercial producers as *Neoseiulus* or *Amblyseius californicus* were mislabelled. Also, he believed that the identity of previous field records of *californicus* are not now reliable.

In 2010, Don's impact in acarology was recognized at the 13th Congress of Acarology (ICA), when he was elected an Honorary Member of Congress (published in *Zoosymposia*, 2011, 6: 3-4). Honorary Membership is conferred for life on outstanding acarologists and his legacy is memorialized in death as an Eternal Member of Congress (confirmed at the recent 15th ICA held in Turkey).

Don is survived by his wife Zofia, and sons Edmund and Huw. They can be very proud of the contribution he made to acarology, the companies he worked with after his retirement and the horticultural sector in general.

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