

Angela E Douglas
CURRICULUM VITAE

January 2012

Academic Record

1978 BA Zoology University of Oxford, UK
1981 PhD University of Aberdeen, UK

Professional Positions

2008-present **Daljit S. and Elaine Sarkaria Professor of Insect Physiology and Toxicology**,
Cornell University, Ithaca, NY
2003-2008 **Professor (personal chair)**, University of York, UK
1999-2003 **Reader**, University of York, UK
1996-1999 **Senior Lecturer**, University of York, UK
1986-1996 **Royal Society University Research Fellow** at University of York
(1992-1996), University of Oxford (1987-1992) and John Innes
Institute (1986-1987)
1985-1986 **Postdoctoral Fellow** at University of East Anglia, UK
1981-1985 **Postdoctoral Fellow** at University of Oxford, UK

Honors and Awards

2011 Elected Fellow of Entomological Society of America
Founders Memorial Lecture of Entomological Society of America
2005-2008 BBSRC Research Fellowship
2007 Invited Lecture to British Association for Advancement of Science
1986-1996 Royal Society University Research Fellowship

Membership of

American Society for Microbiology
Entomological Society of America (elected as Fellow 2011)
International Symbiosis Society
Royal Entomological Society (Fellow)
Society for Experimental Biology

EDITORIAL BOARDS

Journal of Insect Physiology
Physiological Entomology
Entomologia Experimentalis et Applicata

Recent invited conference presentations

2011

Founders Memorial Lecture of the Entomological Society of America in honor and memory of Professor Reg Chapman (at 59th Annual Conference of Entomological Society of America, Reno)

4th ASM Conference on Cell-Cell Communication in Bacteria, Miami, USA

Catalysis Meeting program at The National Evolutionary Synthesis Center on "The origin and evolution of animal-microbe interactions"

Keynote speaker at Conference on Genome Biology of Corals and their Relatives held by ARC Centre of Excellence for Coral Reef Studies, James Cook University, Australia

Session on Insect Symbioses (co-organizer and speaker), Spring Meeting of Society for General Microbiology, Harrogate, UK

Plenary Symposium on Coevolution. 110th Annual Meeting of American Society for Microbiology, New Orleans

2010

PhD Program on Microbial Symbioses, University of Vienna, Austria

3rd ASM Conference on Beneficial Microbes, Miami, Florida

Session on The Role of Microorganisms in the Ecology and Evolution of Tri-Tropic Interactions at the Ecological Society of America, Pittsburgh, USA

Ecology & Evolution of Infection and Disease Conference, Ithaca,

2009

Symposium on Conflict and Cooperation in Symbiosis, 6th International Symbiosis Congress, Madison, Wisconsin, USA

Symposium "What would you tell Darwin?" of the Society for Experimental Biology in collaboration with the Biochemical Society, British Ecological Society and UK Higher Education Academy Centre for Bioscience (Glasgow, UK).

2007

NSF-ARC 'New Frontiers in Cellular Interactions in Symbiosis', Australian Symposium "Symbiosis" at Society for Experimental Biology, Glasgow, UK

Keynote speaker at Aphid Special Interest Group of the Royal Entomological Society, Birmingham, UK

Invited speaker at International Congress of Insect Biochemistry and Industry, Daegu, South Korea

Invited speaker at Symposium of the Collaborative Research Centre SFB479, University of Würzburg, Germany: Host-Pathogen CoEvolution: a Tale of Struggle & Affection

Recent invited Research Seminars

2011

University of Miami, Florida

2010

University of Amsterdam, Netherlands

University of Texas A&M at College Station

Rochester University, USA
Ithaca College, Ithaca, US
University of California at Davis, USA

2009

University of California at Berkeley, USA
University of Connecticut, USA
University of Wisconsin at Madison, USA
Department of Crop Science, Cornell University, USA
Department of Microbiology, Cornell University, USA

2008

Department of Entomology at Geneva, Cornell University, USA

University of Newcastle, UK

2007

University of Princeton, USA
University of Tennessee, US

Recent conference/workshop organizer

2011

Organizer of Patton Symposium and Workshop, Cornell University “Perspectives on Insect Nutrition”
Co-organizer (and speaker) of Symposium on Insect Symbioses at Spring Conference of Society for General Microbiology, Harrogate, UK (with Gavin H Thomas)

2010

Co-organizer (and speaker) of Section Symposium at Entomological Society of America “Diversity and Function of Microbial Symbioses in Solitary and Social Insects” (with Kirk E. Anderson)
Workshop on Metabolite and Nutrient Analysis, in collaboration with Waters Corp.
Diptera Day at Cornell University (with Brian Lazarro)
Co-organizer of Ecology and Evolution of Infectious Diseases (Cornell University)

2009

Cooperation: Self Interest and Mutual Interest. A one-day workshop at Cornell University, co-organized with Mary Alice Coffroth (University at Buffalo) and Anne Clark (Binghamton University), with funding from the SUNY Conversations in the Disciplines Program.

2008

Aphid Day at Cornell University (with Georg Jander)

2007

Two-day symposium on Symbiosis at the Society for Experimental Biology, Glasgow (with Professor B. Osborne)

Recent Public understanding of science/Outreach activities

2011

Discussion session on interactions among organisms, as part of Cornell Institute for Biology Teachers; develop a lab with colleagues in CIBT.

Insectapalooza: Department of Entomology Open Day. Organizer of laboratory exhibit. General Public.

2010

Cooperation: the solution to big problems in biology. One day workshop organized by Cornell Institute of Biology Teachers.

Insectapalooza: Department of Entomology Open Day. Organizer of laboratory exhibit. General Public.

2009

Insectapalooza: Department of Entomology Open Day. Organizer of laboratory exhibit. General Public.

2008

Contribution to MicrobeWorld radio program

Lecture and discussion with secondary school teachers on the teaching of Evolution

Insectapalooza: Department of Entomology Open Day. Organizer of laboratory exhibit. General Public.

2007

Lecture to Yorkshire Philosophical Society

Lecture at British Association for Advancement of Science

GRANT SUPPORT (FROM AUG 2008)

1R01GM095372 (PI Douglas) NIH The protein nutrition of the symbiotic system between Drosophila and its gut microbiota	01/01/11-12/31/14
IOS-0919765 (PI Douglas) NSF Metabolic coupling in an obligate insect-bacterial symbiosis	9/1/2009-8/31/2011
2009-02179 (PI Behmer) USDA-AFRI Control of sap-feeding insect pests by plant sterols	1/1/10-12/31/11
NC-1173 (PI Douglas) USDA-CSREES Metabolic biomarkers for honey bee colony health and morbidity	10/1/09-8/31/12
USDA-AFRI (PI Jander) Osmoregulatory collapse to control phloem-feeding insect pest	02/01/12-01/31/15

TEACHING AND ADVISING RESPONSIBILITIES

- 2011** Insect Physiology: ENTOM 4830 20 lectures and linked labs/projects
Chemical Ecology: (3690) three lectures
Graduate course ENTOM 7670 Current Topics in Entomology: one session 2010
- 2010** Symbiotic Associations: Evolution and Ecology (PLPA4480/BIOMI4480): one
Lecture
ENTOM 7670 Current Topics in Entomology: 1 lecture
- 2009** Insect Physiology (4830) class: 18 lectures and linked labs/projects
ENTOM 7670 Current Topics in Entomology: 1 lecture
- 2008** Invertebrate Pathology (4630): 1 lecture
ENTOM 7670 Current Topics in Entomology 1 lecture

at University of York (prior to 2008)

Undergraduate BSc Biology

Year-1

2001- present Evolution, Adaptation & Diversity module: 4 lectures and 2 practicals on invertebrate diversity

1999-2008 Evolution, Adaptation & Diversity module: 7 lectures on physiology

1996-1998 Ecology module: 9 lectures and one 4-week practical

1996-2008 6 sets of 8 tutorials per year to year-1/year-2 students

Year-3

1996-2008 Final year project students (up to 4 per year)

1992-2008 Symbiosis module: 8 lectures

Masters

1997-2000 MRes Ecology & Environmental Management: Biological Conservation module (8 lectures) and Transferable Skills (1 lecture and assessment)

2002-2005 Projects in MRes Bioinformatics

1996-2001 Projects in MRes Ecology & Environmental Management: 1 or 2 per year

PUBLICATIONS

(For publications post-January 2012, please see website at <http://www.angeladouglaslab.com/publications.html>)

Refereed research articles

1. Wallace IS, Shakesby AJ, Hwang JH, Choi WG, Martinkova N, Douglas AE and Roberts DM, in press. *Acyrtosiphon pisum* AQP2: a multifunctional insect aquaglyceroporin. *Biochimica et Biophysica Acta - Biomembranes*.
2. Taylor, SH, Parker WE and Douglas AE, in press. Patterns in aphid honeydew production and parallel diurnal shifts in phloem sap composition. *Entomologia Experimentalis et Applicata*.
3. Wong CN, Ng P and Douglas AE, 2011. Low diversity bacterial community in the gut of the fruitfly *Drosophila melanogaster*. *Environmental Microbiology* 13: 1889-1900.
4. Behmer ST, Grebenok RJ and Douglas AE, 2011. Plant sterols and host plant suitability for a phloem-feeding insect. *Functional Ecology* 25: 484-491.
5. Vellozo AF, Veron AS, Baa-Puyoulet P, Huerta-Cepas J, Cottret L, Febvay G, Calevro F, Rahbe Y, Douglas AE, Gabaldon T, Sagot M-F, Charles H and Colella S, 2011. CycADS: an annotation database system to ease the development and update of BioCyc databases. *Database (Oxford)*. Apr 7:bar008.
6. Poliakov A, Russell CW, Ponnala L, Hoops HJ, Sun Q, Douglas AE and van Wijk KJ, 2011. Large-scale label-free quantitative proteomics of the pea aphid-*Buchnera* symbiosis. *Molecular and Cellular Proteomics* 10: M10.007039.
7. MacDonald SJ, Thomas GH and Douglas AE, 2011. Genetic and metabolic determinants of nutritional phenotype in an insect-bacterial symbiosis. *Molecular Ecology* 20: 2073-84.
8. Bouvaine S, Boonham N and Douglas AE, 2011. Interactions between a luteovirus and the GroEL chaperonin protein of the symbiotic bacterium *Buchnera aphidicola* of aphids. *Journal of general Virology*. 92: 1467-74.
9. Douglas AE, Bouvaine S and Russell R, 2011. How the insect immune system interacts with an obligate symbiotic bacterium. *Proceedings of the Royal Society of London B* 278, 333-338.
10. The International Aphid Genomics Consortium, 2010. Genome sequence of the pea aphid *Acyrtosiphon pisum*. *PLoS Biology* 8: e1000313.
11. Wilson ACC, Ashton PD, Calevro F, Charles H, Colella S, Febvay G, Jander G, Kushlan P, Macdonald SA, Schwartz J, Thomas GH and Douglas AE, 2010. Genomic insight into the amino acid relations of the pea aphid *Acyrtosiphon pisum* with its symbiotic bacterium *Buchnera aphidicola*. *Insect Molecular Biology* 19: S2, 249-258

12. Ramsey JS, MacDonald SJ, Jander G, Nakabachi A, Thomas GH and Douglas AE, 2010. Genomic evidence for complementary purine metabolism in the pea aphid *Acyrtosiphon pisum* and its symbiotic bacterium *Buchnera aphidicola*. *Insect Molecular Biology* 19: S2, 241-248
13. Price DRG, Tibbles K, Shigenobu S, Smertenko A, Russell CW, Douglas AE, Fitches E, Gatehouse AMR and Gatehouse JA, 2010. Sugar transporters of the major facilitator superfamily in aphids; from gene prediction to functional characterization. *Insect Molecular Biology* 19: S2, 97-112.
14. Wang Y, Carolan JC, Hao, F-H, Nicholson, J, Wilkinson TL and Douglas AE, 2010. Integrated metabonomic-proteomic analysis of an insect-bacterial symbiotic system. *Journal of Proteome Research* 9: 1257-1267
15. Hazell SP, Neve BP, Groutides C, Douglas AE, Blackburn TM and Bale JS, 2010. Hyperthermic aphids: insights into behaviour and mortality. *Journal of Insect Physiology* 56, 123-131.
16. Hawkes CV, Douglas AE and Fitter AH, 2010. Origin, local experience and the relative impact of biotic interactions on native and introduced *Senecio* species. *Biological Invasions* 12, 113-124.
17. Bermingham J, Rabatel A, Calevro F, Viñuelas J, Febvay G, Charles H, Douglas AE and Wilkinson TL 2009. Impact of host developmental age on the transcriptome of the symbiotic bacterium *Buchnera aphidicola* in the pea aphid *Acyrtosiphon pisum*. *Applied and Environmental Microbiology* 75: 7294-7
18. Thomas GH, Zucker J, Macdonald AJ, Sorokin A, Goryanin I and Douglas AE. 2009. A fragile metabolic network adapted for cooperation in the symbiotic bacterium *Buchnera aphidicola*. *BMC Systems Biology* 3, 24.
19. Gündüz, E.A. and Douglas, A.E. 2009. Symbiotic bacteria enable insect to utilise a nutritionally-inadequate diet. *Proceedings of the Royal Society of London B*. 276: 987-991.
20. Shakesby AJ, Wallace IS, Isaacs HV, Pritchard J, Roberts DM and Douglas AE 2008. A water-specific aquaporin involved in aphid osmoregulation. *Insect Biochemistry and Molecular Biology*, 39, 1-10.
21. Venn, AA, Loram JE, Trapido-Rosenthal HG, Joyce DA and Douglas AE. 2008. The importance of time and place: patterns in abundance of *Symbiodinium* clades A and B in the tropical sea anemone. *Biological Bulletin* 215, 243-252.
22. Fitches E, Wiles D, Douglas AE, Hinchcliffe G, Audsley N and Gatehouse JA, 2008. The insecticidal activity of recombinant garlic lectins towards aphids. *Insect Biochemistry and Molecular Biology* 38, 905-915.

23. Chandler SM, Wilkinson TL and Douglas AE, 2008. Impact of plant nutrients on the relationship between a herbivorous insect and its symbiotic bacteria. *Proceedings of the Royal Society of London B* 275, 565-570.
24. Loram JE, Trapido-Rosenthal HG and Douglas AE, 2007. Functional significance of genetically different symbiotic algae, *Symbiodinium*, in a coral reef symbiosis. *Molecular Ecology*, 16: 4849-4857.
25. Visram, S. and Douglas AE, 2007. Resilience and acclimation to bleaching stressors in the scleractinian coral *Porites cylindrica*. *Journal of Experimental Marine Biology and Ecology* 349, 35-44.
26. Pescod KV, Quick WP and Douglas AE, 2007. Aphid responses to plants with genetically manipulated phloem nutrient levels. *Physiological Entomology* 32, 253-258.
27. Loram JE, Boonham N, O'Toole P, Trapido-Rosenthal HG and Douglas AE, 2007. Molecular quantification of symbiotic dinoflagellate algae of the genus *Symbiodinium*. *Biological Bulletin* 212, 259-268.
28. Reymond, N, Calevro F, Viñuelas J, Morin N, Rahbé Y, Febvay G, Laugier C, Douglas AE, Fayard J-M and Charles H 2006. Different levels of transcriptional regulation due to trophic constraints in the reduced genome of *Buchnera aphidicola* APS. *Applied and Environmental Microbiology* 72, 7760-7766.
29. Price DRG, Karley AJ, Ashford DA, Isaacs HV, Pownall ME, Wilkinson HS, Gatehouse JA and Douglas AE, 2007. Molecular characterisation of a candidate gut sucrose in the pea aphid *Acyrtosiphon pisum*. *Insect Biochemistry and Molecular Biology* 37, 307-317
30. Venn AA, Wilson MA, Trapido-Rosenthal HG, Keely BJ and Douglas AE. 2006. The impact of coral bleaching on the pigment profile of the symbiotic alga, *Symbiodinium*. *Plant, Cell and Environment* 29, 2133-2142
31. Visram S, Wiedenmann J and Douglas AE. 2006 Molecular diversity of symbiotic algae *Symbiodinium* (zooxanthellae) in cnidarians of the Mediterranean Sea. *Journal of the Marine Biological Association UK* 86, 1281-3.
32. Douglas, AE, Francois, CLMJ and Minto LB, 2006. Facultative 'secondary' bacterial symbionts and the nutrition of the pea aphid, *Acyrtosiphon pisum*. *Physiological Entomology* 31, 262-269
33. Barbrook AC, Visram S, Douglas AE and Howe CJ. 2006. Molecular diversity of dinoflagellate symbionts of Cnidaria: the *psbA* minicircle of *Symbiodinium*. *Protist* 157, 159-171.
34. Douglas AE, Price DRG, Minto LB, Jones E, Pescod, KV, Francois CLMJ, Pritchard J and Boonham N, 2006. Sweet problems: insect traits defining the limits to dietary sugar utilisation by the pea aphid, *Acyrtosiphon pisum*. *Journal of Experimental Biology* 209, 1395-1403.
35. Prickett MD, Page M, Douglas AE and Thomas GH, 2006. *Buchnera*BASE: a post-genomic resource for *Buchnera* sp. APS. *Bioinformatics* 22, 641-2.
36. Visram S and Douglas AE 2006. Molecular diversity of symbiotic algae (zooxanthellae) in scleractinian corals of Kenya. *Coral Reefs* 25, 172-6.

37. Karley AJ, Ashford DA, Minto LB, Pritchard J and Douglas AE 2005. The significance of gut sucrase activity for osmoregulation in the pea aphid, *Acyrtosiphon pisum*. *Journal of Insect Physiology* 51, 1313-1319.
38. Darby AC, Chandler SM, Welburn SC and Douglas AE 2005. Symbiotic bacteria of aphids cultured in insect cell lines. *Applied and Environmental Microbiology* 71, 4833-4839
39. Tosh CR, Morgan D, Walters KFA and Douglas AE 2004. The significance of overlapping plant range in the aphid species complex *Aphis fabae* Scop. *Ecological Entomology* 29, 488-497.
40. Birkle LM, Minto LB, Walters KFA and Douglas AE. Microbial genotype and insect fitness in an aphid-bacterial symbiosis. *Functional Ecology* 18, 598-604.
41. Ferrari J, Darby AC, Daniell TJ, Godfray HCJ and Douglas AE 2004. Linking the bacterial community in pea aphids with host-plant use and natural enemy resistance. *Ecological Entomology* 29, 60-65.
42. Cloutier C and Douglas AE. 2003. Impact of a parasitoid on the bacterial symbiosis of its aphid host. *Entomologia Experimentalis et Applicata* 109, 13-19.
43. Haynes S, Darby AC, Daniell TJ, Webster G, van Veen FJF, Godfray HCJ, Prosser JI and Douglas AE 2003. The diversity of bacteria associated with natural aphid populations. *Applied and Environmental Microbiology* 69, 7216-7223.
44. Karley AJ, Pitchford JW, Douglas AE, Parker WE and Howard JJ. 2003. The causes and processes of the mid-summer population crash of potato aphids. *Bulletin of Entomological Research* 93, 425-437.
45. Whitehead LF and Douglas AE 2003. Metabolite comparisons and the identity of nutrients translocated from symbiotic algae to an animal host. *Journal of experimental Biology* 206, 3149-3157.
46. Darby AC and Douglas AE. 2003. Elucidating the transmission patterns of an insect-borne bacterium. *Applied and Environmental Microbiology* 69, 4403-4407.
47. Darby AC, Tosh CR, Walters KFA and Douglas AE. 2003. The significance of a facultative bacterium to natural populations of the pea aphid *Acyrtosiphon pisum*. *Ecological Entomology* 28, 145-150.
48. Wilkinson TL and Douglas AE. 2003. Phloem amino acids and the host plant range of the polyphagous aphid, *Aphis fabae*. *Entomologia Experimentalis et Applicata* 106, 1-11.
49. Johnson SN, Douglas, AE, Woodward, S and Hartley, SE. 2003. Microbial impacts on plant-herbivore interactions: the indirect effects of a birch pathogen on a birch aphid. *Oecologia* 134, 388-396.
50. Birkle LM, Minto LB and Douglas AE. 2002. Relating genotype and phenotype for tryptophan synthesis in an aphid-bacterial symbiosis. *Physiological Entomology* 27, 1-5.
51. Savage AM, Goodson MS, Visram S, Trapido-Rosenthal H, Wiedenmann J and Douglas AE. 2002. Molecular diversity of symbiotic algae at the latitudinal margins of their distribution:

- dinoflagellates of the genus *Symbiodinium* in corals and sea anemones. *Marine Ecology Progress Series* 244, 17-26.
52. Savage AM, Trapido-Rosenthal H and Douglas AE. 2002. On the functional significance of molecular variation in *Symbiodinium*, the symbiotic algae of Cnidaria: photosynthetic response to irradiance. *Marine Ecology Progress Series* 244, 27-37.
 53. Karley, AJ, Douglas, AE and Parker WE. 2002. Amino acid composition and nutritional quality of potato leaf phloem sap for aphids. *Journal of experimental Biology* 205, 3009-3018.
 54. Johnson, SN, Mayhew PJ, Douglas AE and Hartley SE. 2002. Insects as leaf engineers - can leaf miners alter leaf structure for birch aphids. *Functional Ecology* 16, 575-584.
 55. Brown BE, Dunne RP, Goodson MS and Douglas AE 2002. Experience shapes the susceptibility of a reef coral to bleaching. *Coral Reefs* 21, 119-126.
 56. Wilkinson TL, Adams D, Minto LB and Douglas AE 2001. The impact of host plant on the abundance and function of symbiotic bacteria in an aphid. *Journal of experimental Biology* 204, 3027-38.
 57. Raymond B, Searle JB and Douglas AE 2001. On the processes shaping reproductive isolation in aphids of the *Aphis fabae* (Scop.) complex (Aphididae: Homoptera). *Biological Journal of the Linnean Society* 74, 205-215.
 58. Goodson MS, Whitehead LF and Douglas AE 2001. Symbiotic dinoflagellates in marine Cnidaria: diversity and function. *Hydrobiologia* 461, 79-82.
 59. Wilkinson TL, Minto LB and Douglas AE. 2001. Amino acids as respiratory substrates in aphids: an analysis of *Aphis fabae* reared on plants and diets. *Physiological Entomology* 26, 225-8.
 60. Darby AC, Birkle LM, Turner SL and Douglas AE, 2001 An aphid-borne bacterium allied to the secondary symbionts of whitefly. *FEMS Microbiology Ecology* 36, 43-50.
 61. Tosh CR, Walters KFA and Douglas AE, 2001. On the mechanistic basis of plant affiliation in the black bean aphid (*Aphis fabae*) species complex. *Entomologia Experimentalis et Applicata* 99, 121-125..
 62. Douglas AE, Minto LB and Wilkinson TL, 2001. Quantifying nutrient production by the microbial symbiosis in an aphid. *Journal of Experimental Biology*, 204, 349-358.
 63. Raymond, B., Darby, A. C. and Douglas, A. E. 2000. Intraguild predation and the spatial distribution of a parasitoid. *Oecologia* 124, 367-72.
 64. Douglas, A. E. 2000. Reproductive diapause and the bacterial symbiosis in the sycamore aphid *Drepanosiphum platanoidis* (Schr.). *Ecological Entomology* 25, 256-61.
 65. Raymond, B., Darby, A. C. and Douglas, A. E. 2000. The olfactory responses of coccinellids to aphids on plants. *Entomologia Experimentalis et Applicata* 95, 113-7.
 66. Brown, B. E., Dunne, R. P., Goodson, M. S. and Douglas, A. E. 2000. Bleaching patterns in reef corals. *Nature* 404, 142-3.

67. Ashford, D.A., Smith W.A. and Douglas, A. E. 2000 Living on a high sugar diet: the fate of sucrose ingested by a phloem-feeding insect, the pea aphid *Acyrtosiphon pisum*. *Journal of Insect Physiology* 46, 335-342
68. Wang, J.T. and Douglas, A.E., 1999. Essential amino acid synthesis and nitrogen recycling in an alga-invertebrate symbiosis. *Marine Biology* 135, 219-222.
69. Birkle, L.M. and Douglas, A.E., 1999. Low genetic diversity among pea aphids (*Acyrtosiphon pisum*) biotypes of different plant affiliation. *Heredity* 82, 605-12.
70. Wilkinson, T.L. and Douglas, A.E., 1998. Host cell allometry and regulation of the symbiosis between pea aphids, *Acyrtosiphon pisum*, and bacteria, *Buchnera*. *Journal of Insect Physiology* 44, 629-635.
71. Wang, J-T and Douglas, A. E., 1998. Nitrogen recycling or nitrogen conservation in an alga-invertebrate symbiosis? *Journal of experimental Biology* 201, 2445-53.
72. Wilkinson, T.L. and Douglas, A.E., 1998. Plant penetration by pea aphids (*Acyrtosiphon pisum*) of different plant range. *Entomologia Experimentia et Applicata* 87, 43-50.
73. Wilkinson, T.L., Ashford, D.A., Pritchard, J. and Douglas, A.E., 1997. Honeydew sugars and osmoregulation in the pea aphid *Acyrtosiphon pisum*. *Journal of experimental Biology* 200, 2137-43.
74. Humphreys, N.J. and Douglas, A.E., 1997. The partitioning of symbiotic bacteria between generations of an insect: a quantitative study of *Buchnera* in the pea aphid (*Acyrtosiphon pisum*) reared at different temperatures. *Appl. Environ. Microbiol.* 63: 3294-6.
75. Bythell, J.C., Douglas, A.E., Sharp, V.A., Searle, J.B. and Brown, B.E. 1997. Algal genotype and photoacclimatory responses of the symbiotic algae *Symbiodinium* in natural populations of the sea anemone *Anemonia viridis*. *Proceedings of the Royal Society of London B* 264, 1277-1282.
76. Wang, J-T and Douglas, A.E. 1997. Nutrients, signals and photosynthate release by symbiotic algae: the impact of taurine on the dinoflagellate alga *Symbiodinium* from the sea anemone *Aiptasia pulchella*. *Plant Physiology* 114, 631-6.
77. Douglas, AE. 1997. Provenance, experience and host plant affiliation in the polyphagous aphid, *Aphis fabae*. *Entomol. Exp. Appl.* 83: 161-70.
78. Adams, D. and Douglas, A.E. 1997. How symbiotic bacteria influence plant utilisation by the polyphagous aphid, *Aphis fabae*. *Oecologia* 110:528-32.
79. Wilkinson, T.L. and Douglas, A.E. 1996. The impact of aposymbiosis on amino acid metabolism of pea aphids (*Acyrtosiphon pisum*). *Entomol. Exp. Appl.*, 80: 279-282.
80. Douglas, A.E. 1996. Reproductive failure and the amino acid pools in pea aphids (*Acyrtosiphon pisum*) lacking symbiotic bacteria. *Journal of Insect Physiology* 42, 247-255.
81. Adams, D., Wilkinson, T.L. and Douglas, A.E. 1996. The aphid-bacterial symbiosis: a comparison between pea aphids (*Acyrtosiphon pisum*) and black bean aphids (*Aphis fabae*). *Entomologia Experimentalis et Applicata* 80, 275-278.

82. Wilkinson T.L. and Douglas A.E. 1995. Why aphids lacking symbiotic bacteria have elevated levels of the amino acid glutamine. *Journal of Insect Physiology* 41, 921-927.
83. Wilkinson T.L. and Douglas A.E. 1995. Aphid feeding, as influenced by the disruption of the symbiotic bacteria. *Journal of Insect Physiology* 41, 635-640.
84. Simpson SJ, Abisgold JD and Douglas AE 1995. Response of the pea aphid *Acyrtosiphon pisum*) to variation in dietary levels of sugar and amino acids: the significance of amino acid quality. *Journal of Insect Physiology* 41, 41-46.
85. Abisgold JD, Simpson SJ and Douglas AE 1994. Nutrient regulation in the pea aphid *Acyrtosiphon pisum*: application of a novel geometric framework to sugar and amino acid consumption. *Physiological Entomology* 19, 95-102.
86. Whitehead LF and Douglas AE 1993. A metabolic study of *Buchnera*, the intracellular bacterial symbionts of the pea aphid, *Acyrtosiphon pisum*. *Journal of general Microbiology* 139, 821-826.
87. Douglas AE 1993. The nutritional quality of phloem sap utilized by natural aphid populations. *Ecological Entomology* 18, 31-38.
88. Rands ML, Loughman BC and Douglas AE 1993. The symbiotic interface in an alga-invertebrate symbiosis. *Proceedings of the Royal Society of London B* 253, 161-165.
89. Hay DB, Hart BJ and Douglas AE 1993. Effects of the fungus *Aspergillus penicillioides* on the house dust mite *Dermatophagoides pteronyssinus*: an experimental re-evaluation. *Medical and Veterinary Entomology* 7, 271-274.
90. Whitehead LF and Douglas AE 1993. Populations of symbiotic bacteria in the parthenogenetic pea aphid (*Acyrtosiphon pisum*) symbiosis. *Proceedings of the Royal Society of London B* 254, 29-32.
91. Douglas AE and Prosser WA 1992. Synthesis of the essential amino acid tryptophan in the pea aphid (*Acyrtosiphon pisum*) symbiosis. *Journal of Insect Physiology* 38, 565-568.
92. Douglas AE 1992. Requirement of pea aphids (*Acyrtosiphon pisum*) for their symbiotic bacteria. *Entomol. exp. appl.* 65: 195-198.
93. Hay DB, Hart BJ and Douglas AE 1992. Evidence refuting the contribution of the fungus *Aspergillus penicillioides* to the allergenicity of the house dust mite *Dermatophagoides pteronyssinus*. *International Archives of Allergy & Immunology* 97, 86-88.
94. Rands ML, Douglas AE, Loughman BC and Ratcliffe RG 1992. Avoidance of hypoxia in a cnidarian symbiosis by algal photosynthetic oxygen. *Biological Bulletin* 182, 159-162.
95. Rands ML, Douglas AE, Loughman BC and Hawes CR 1992. The pH of the perisymbiont space in the green hydra-Chlorella symbiosis. *Protoplasma* 170, 90-93.
96. Hay DB, Hart BJ, Pearce RB, Kozakiewicz Z and Douglas AE 1992. How relevant are house dust mite-fungal interactions in laboratory culture to the natural dust system? *Experimental & Applied Acarology* 16, 37-47.

97. Whitehead LF, Wilkinson TL and Douglas AE 1992. Nitrogen recycling in the pea aphid (*Acyrtosiphon pisum*) symbiosis. *Proceedings of the Royal Society of London B* 250, 115-117.
98. Prosser WA and Douglas AE 1992. A test of the hypotheses that nitrogen is upgraded and recycled in an aphid (*Acyrtosiphon pisum*) symbiosis. *Journal of Insect Physiology* 38, 93-99.
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